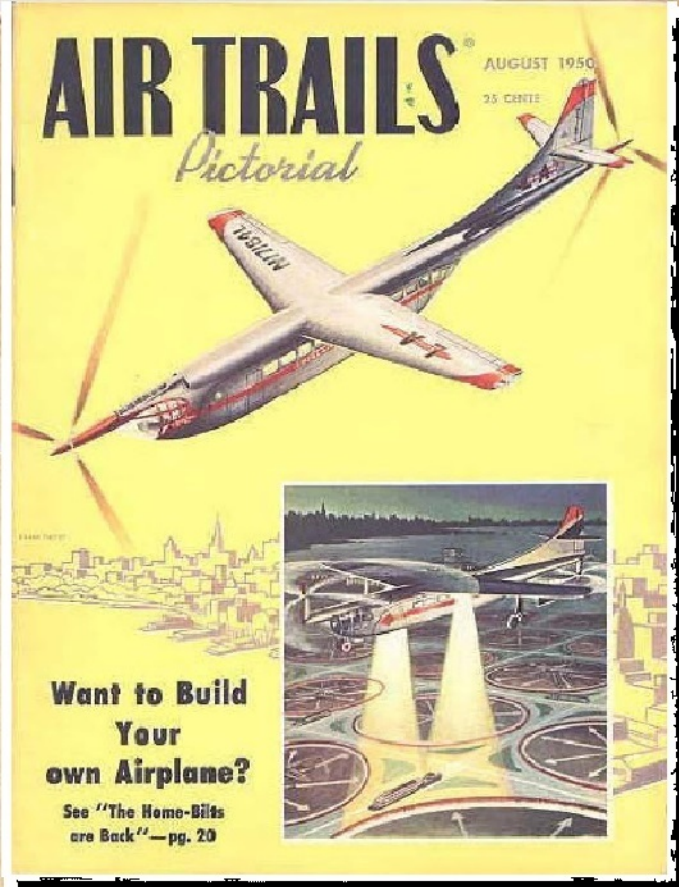

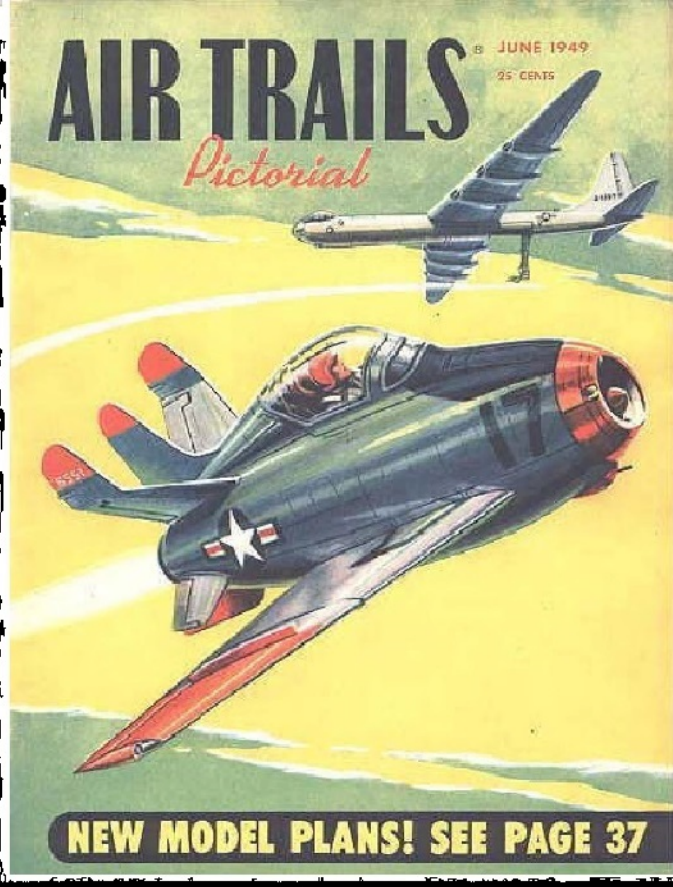

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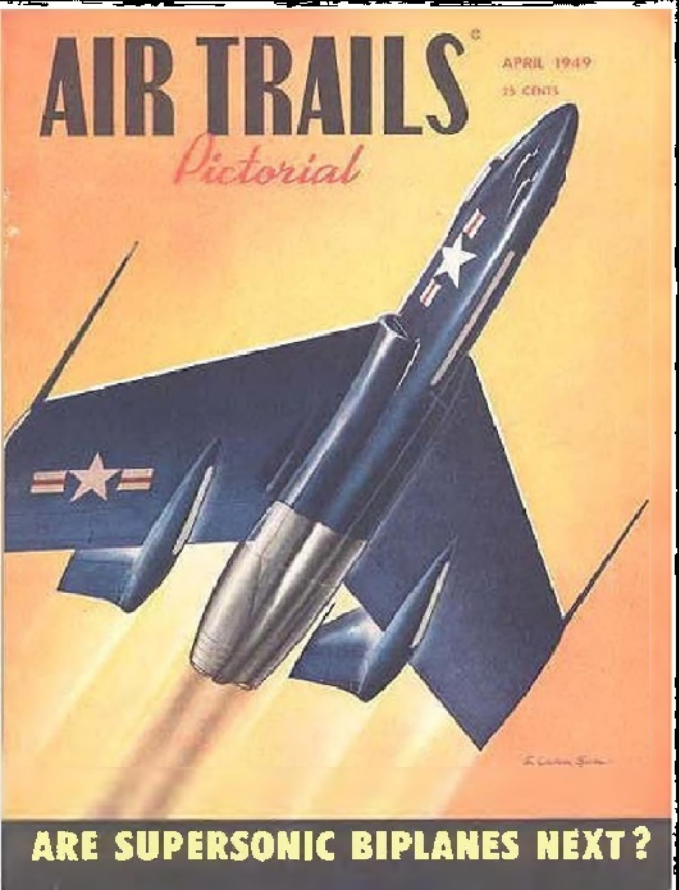

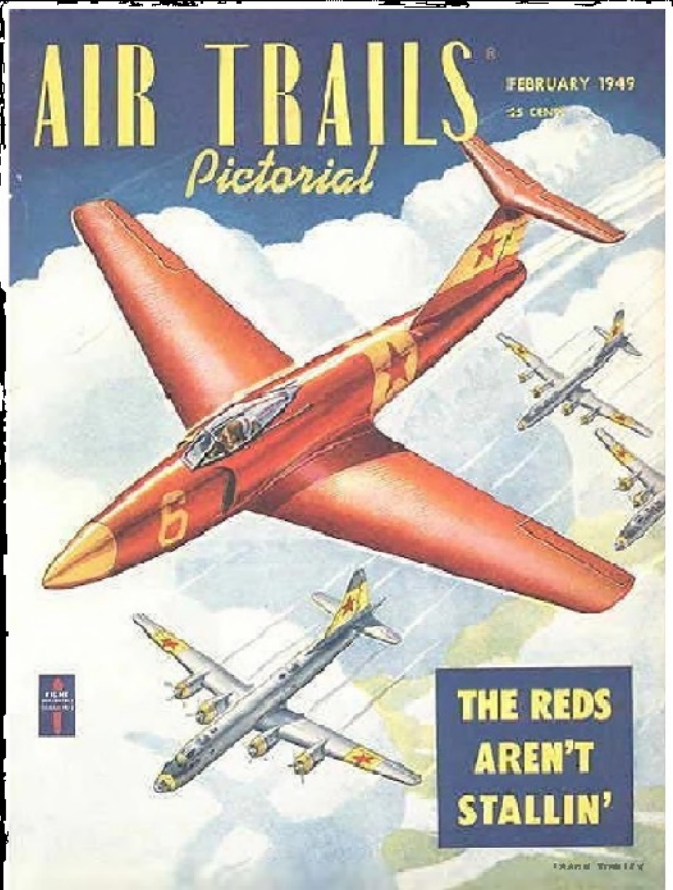

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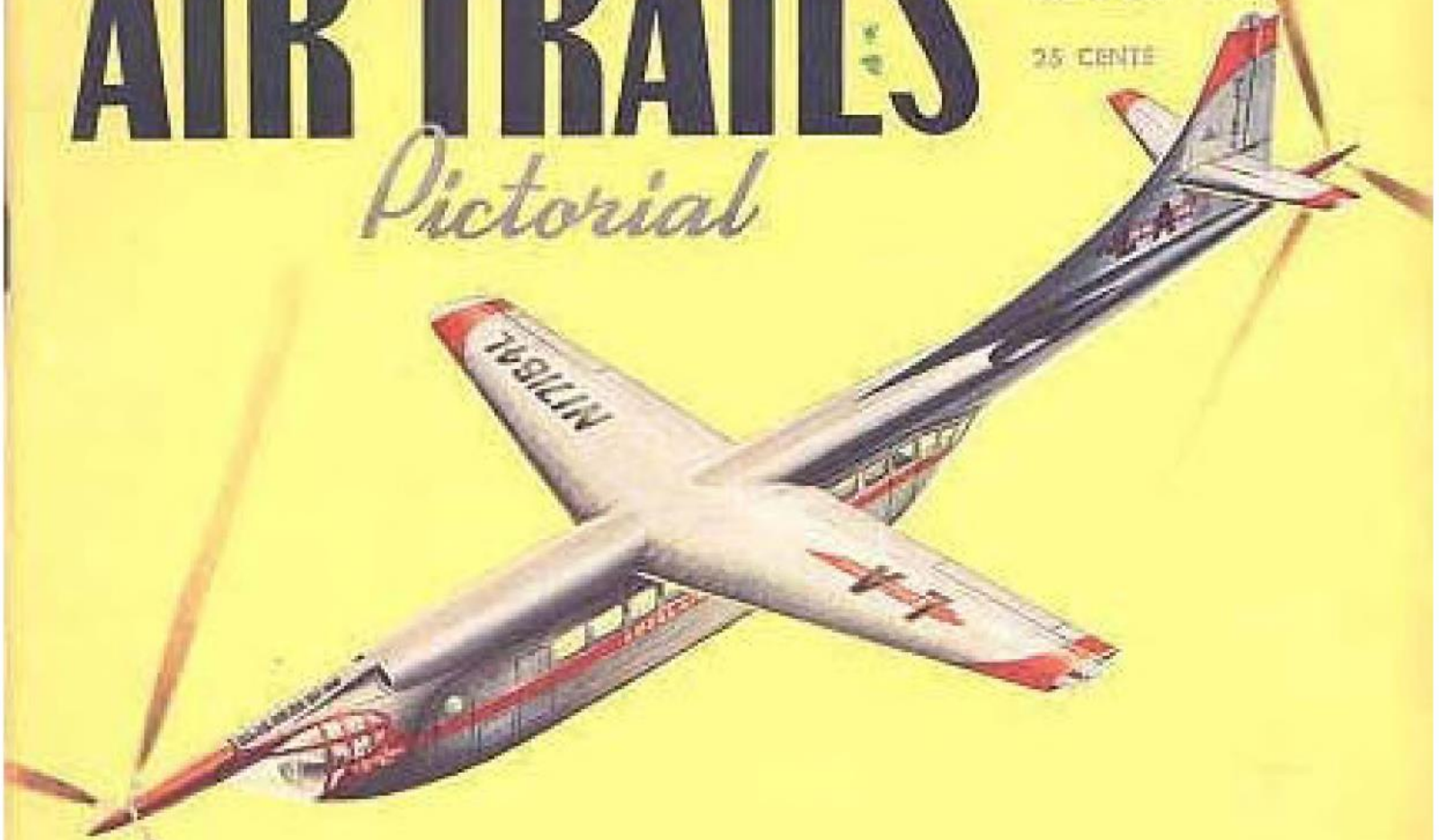
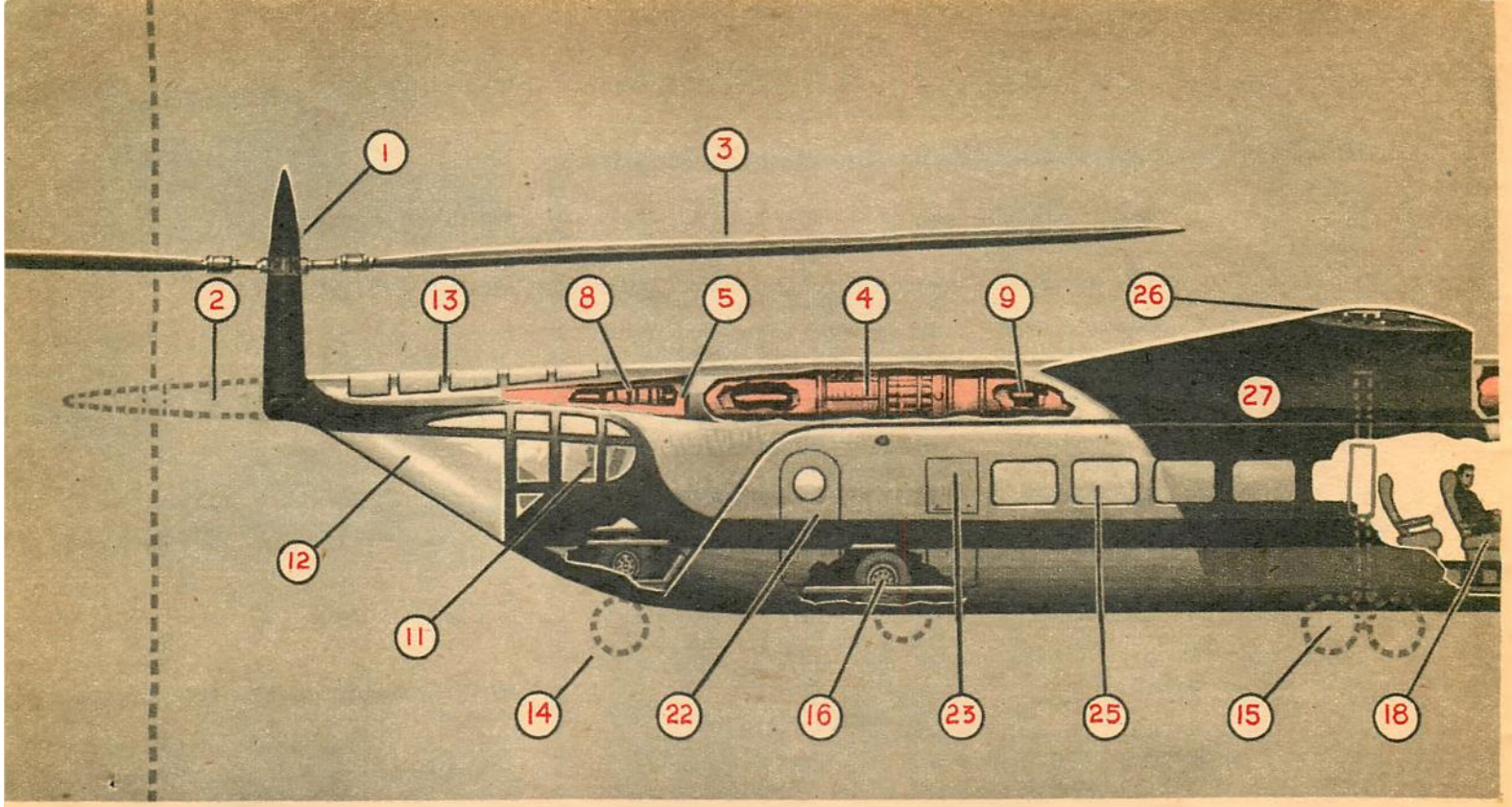


Want to Build Your own Airplane?

See "The Home-Bilts are Back"—pg. 20



The Case for the Convertaplane

By CAPT. RALPH S. BARNABY, USN (Ret.)

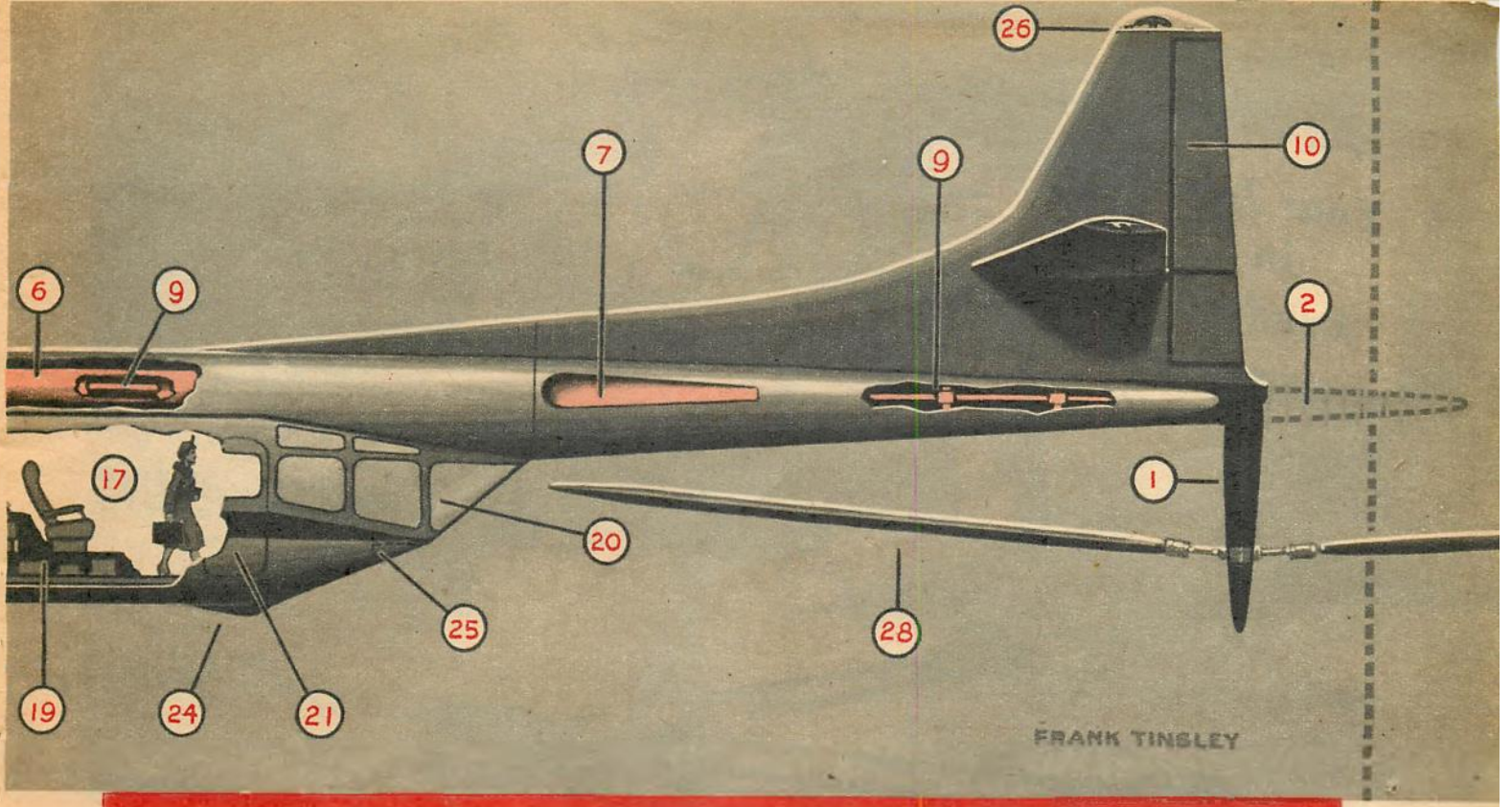
Advantages of convertible aircraft far outweigh the many technical problems that must be licked

■ During the past 18 months, the appearance of the term "convertible aircraft" or "convertaplane" has been mentioned with increasing frequency. Starting with a paper on the subject presented at the 1949 annual meeting of the Institute of the Aeronautical Sciences and culminating with a Convertible Aircraft Congress held in Philadelphia last December, an ever-growing amount of technical study and discussion is being devoted to the possibilities of this form of aircraft.

By "convertible aircraft" is meant the form of flying machine which may operate either as a helicopter or as a conventional airplane. The modern airplane can fly fast and fairly effectively. It is controllable, stable and relatively easy to fly at normal speeds: but stalling and landing speeds are high, and control at low speed leaves much to be desired. The helicopter, on the other hand, can rise and descend vertically as well as hover. Its control is practically independent of speed, but its high speed and fuel economy are relatively poor and it is comparatively unstable, requiring constant flying.

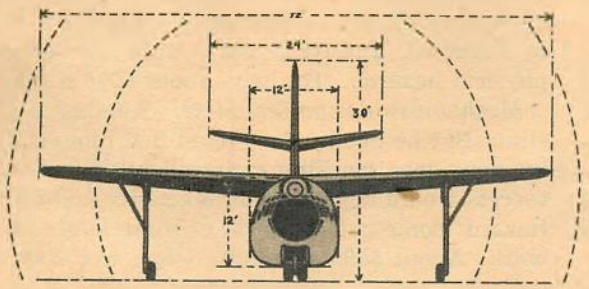
What could be more natural than to combine the airplane and the helicopter so as to realize the good points of both without adopting, at the same time, their bad ones. That, in a nutshell, is the idea of the convertaplane. Imagine an aircraft which may rise vertically from restricted areas and hover over a given spot like a helicopter, but which at your command can fly like an airplane from place to place with an airplane's stability, piloting ease, fuel economy, and high speed.

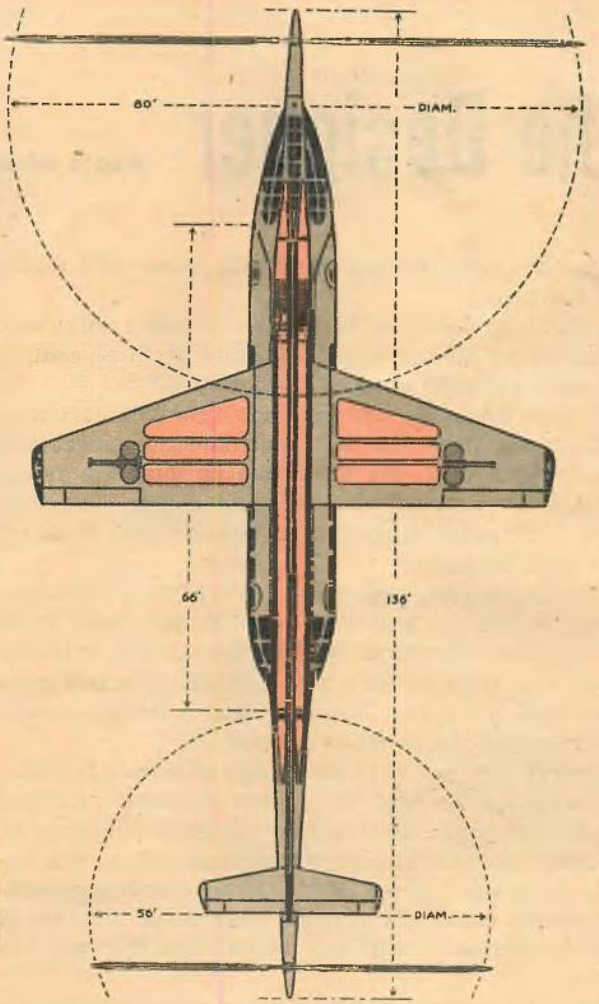
We can afford to overlook the relatively high fuel consumption of the craft when operating as a helicopter, taking off, hovering, and landing, because these operations are of (*Continued on page 81*)



CONVERTAPLANE CUTAWAY KEY

1. Rotoprops in vertical position act as helicopter rotors.
2. Rotoprops in horizontal position act as plane props.
3. Three-bladed main rotoprop—80' in diameter.
4. Twin propjet gas turbines.
5. Flush air inlet on each side for turbine.
6. Twin tail pipes for jet exhaust.
7. Flush exhaust outlet on each side.
8. Central reduction gears permit engines to be used singly or together.
9. Coupled drive shafts connect gear box to both rotoprops.
10. Smaller control areas used only at hi-horizontal speeds.
11. "Front office" connects with door in end of bus body.
12. Full vision Plexiglas nose.
13. Top vision windows in shaft tunnel.
14. Dual nose wheels retract into pilot's compartment.
15. F-91 type tandem main wheels retract into wings.
16. Dual bus wheels for ground towing of cabin.
17. Detachable airbus seats 40 passengers.
18. Passenger seats face rearward for safety.
19. Stowage space for hand luggage beneath seats.
20. Extra fare observation bay seats four.
21. Rear exit door on each side.
22. Forward emergency exit doors on each side.
23. Outside hatches facilitate mail and cargo loading.
24. Safety skids.
25. Large rectangular windows permit good view.
26. Radio antennae in plastic fin and wing tips.
27. Fuel tanks in inner wing panels.
28. After rotoprop—56' in diameter.

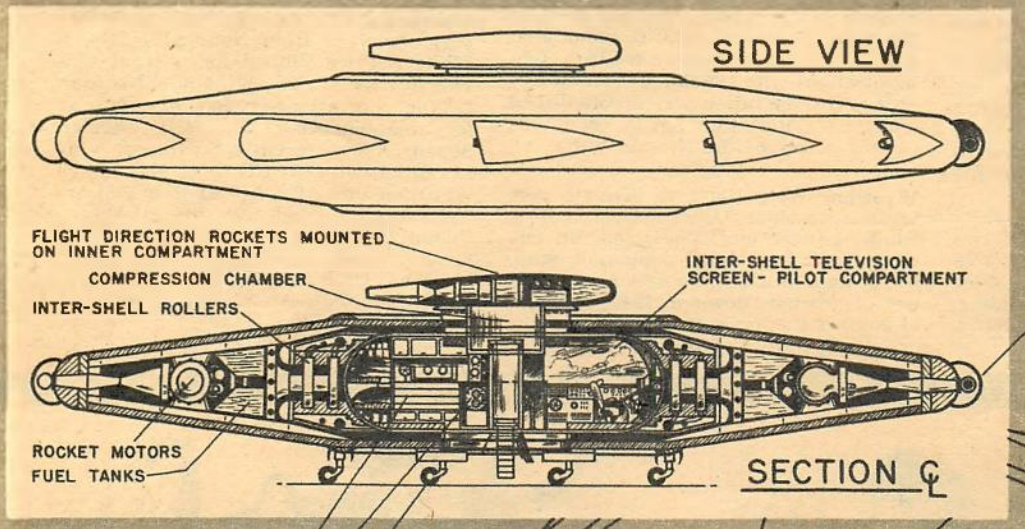


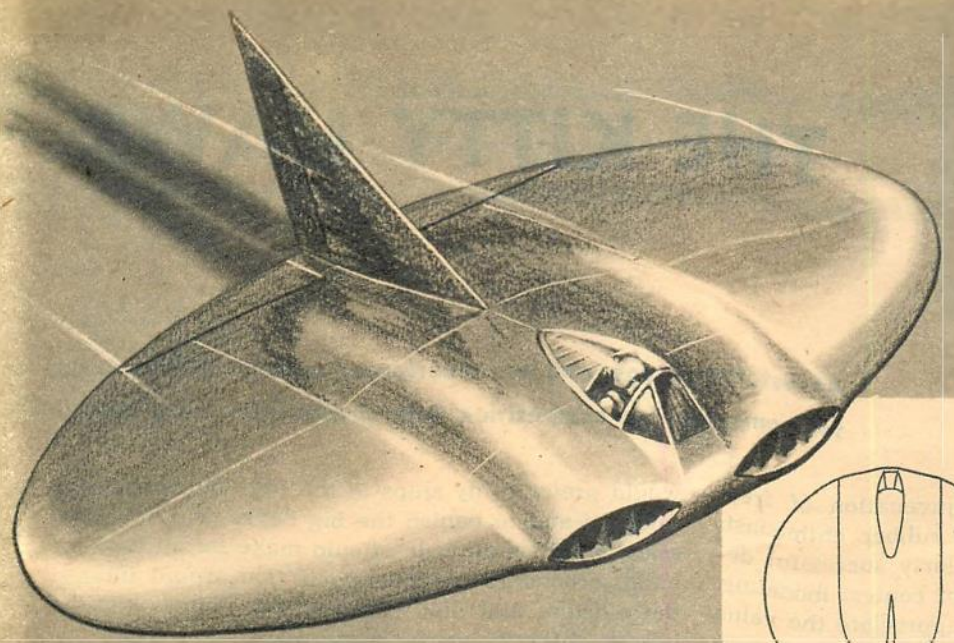


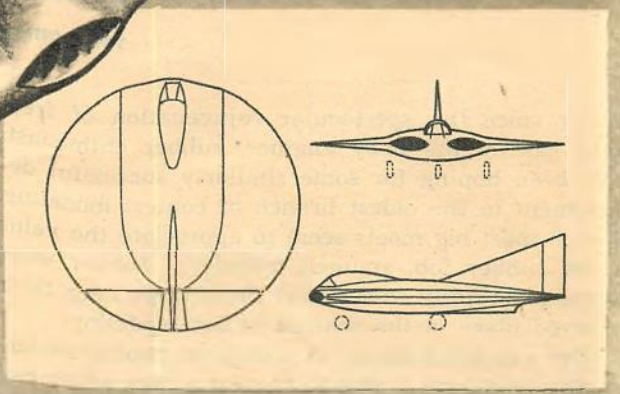
Airmen of Vision
DESIGN COMPETITION

With Flying Saucer excitement still sky-high, we present our readers' ideas of these mysterious gadabouts.

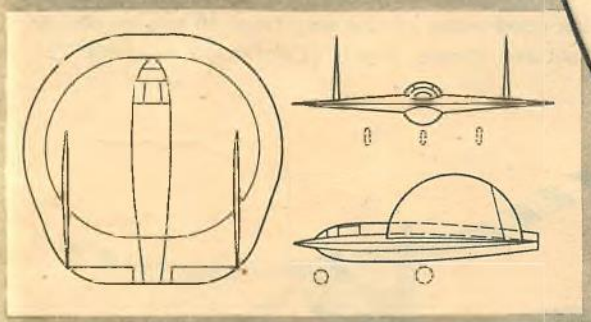
● First prize: by John B. Fuller III, a rocket-propelled Flying Disk, suitable for space travel. Revolving outer shell is powered by 12 rocket units. Disk diameter is 90 ft., height 20 ft. 6 in. Cabin diameter 30 feet, height 9 feet. Outer shell rotates around inner one at varying speeds. Rocket nozzles swivel for change of flight direction.

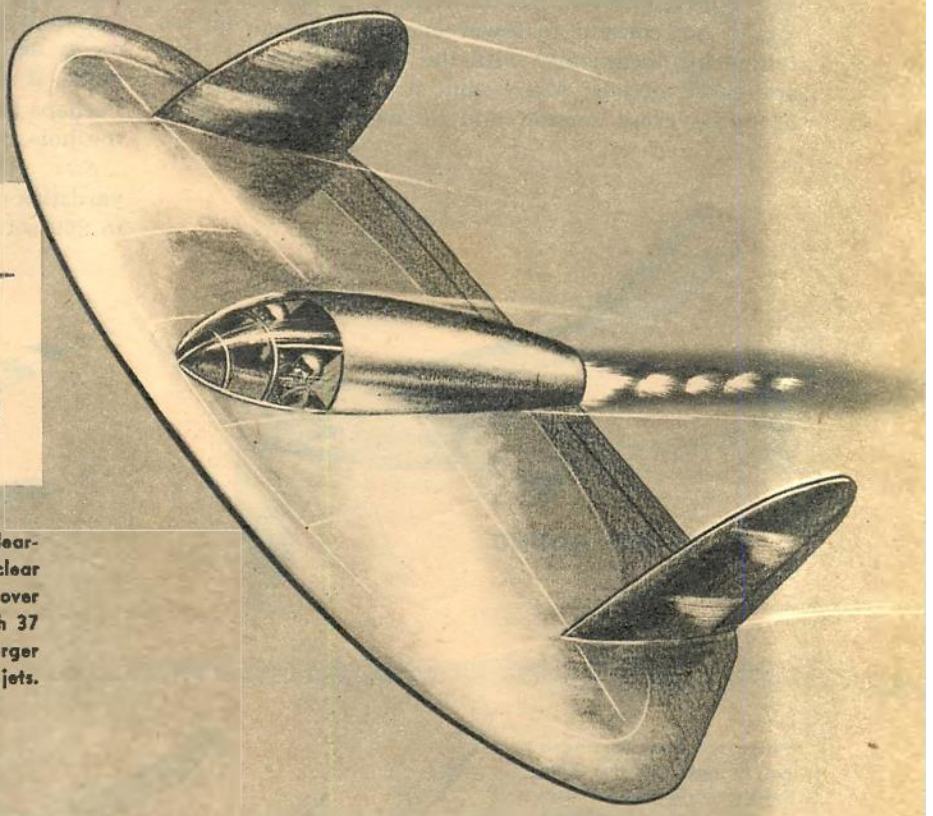






● Second prize: by James Burruss, Los Angeles, Calif. A twin-jet powered, circular wing aircraft, it's a neat-looking "saucer" which should do at least 1000 mph. Unfortunately, Jim did not include any specifications. Control is achieved by "elevons" located in the trailing edge of the wing, the shape of which would accommodate a large fuel capacity.





● Third prize: by John Patillo of Richmond, Va. A nuclear-energy powered "saucer" interceptor armed with nuclear disintegrators. Carries a crew of two, has a speed of over 2000 mph and a range of 15,000. Span is 34 ft., length 37 ft., height 13 feet. John claims that a version six times larger is O. K. for interplanetary travel. Small model can fly on jets.

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three-views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of the proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and judges. Designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should retain copies of all material submitted. Mail entries to Airmen of Vision, c/o Air Trails, Box 489, Elizabeth, N. J. The editors regret that because of large number of entries they cannot enter into correspondence on Airmen of Vision.

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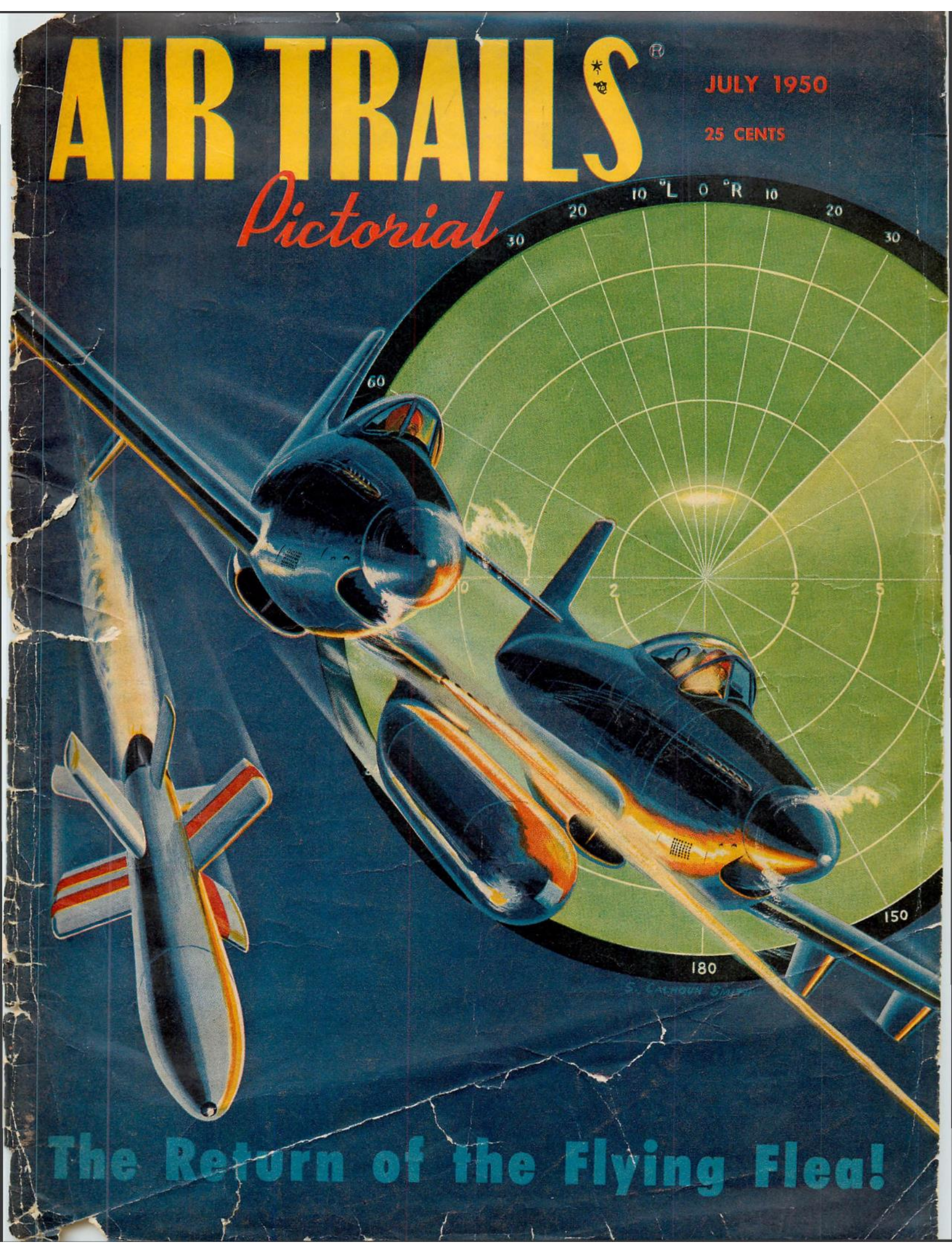
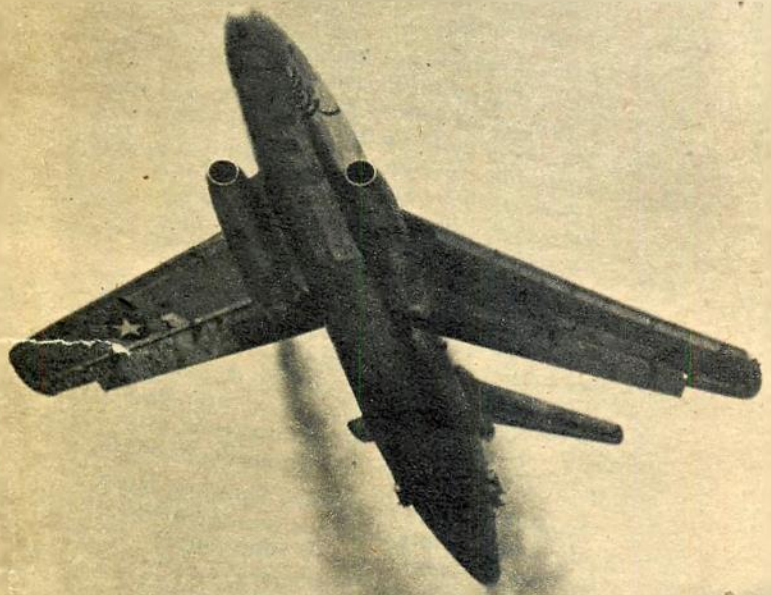


The Return of the Flying Flea!

keeping pace with

Air Progress



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AIR TRAILS Pictorial

JULY, 1950 • VOL. XXXIV, No. 4

IN THIS ISSUE:

Cover: F-82 and Firebird Rocket	F. Calhoun Smith	1
Showcase		10
Development Highlights		14
Air Notes		16
The Flea Flies Again	A. R. Weyl	19
The British Do It—Why Can't We?		22
Next Step in Big Bombers?	Frank Tinsley	24
Your Job in Aviation: A & E Mechanic		26
Air Progress: The Aeroplane—Part 2	Douglas Rolfe	28
Solo Club		30
C. A. P. Newsletter		31
Airmen of Vision		33
Air Forum		34
Texaco No. 13	Walter A. Musciano	36
Model Engine Fuels	Walton Hughes	38
Skylark	Peter Franklin	40
Dope Can		42
The Challenger	Bob Bienenstein	44
De Havilland Trainer	Warner Frake	48
Stutz Bearcat	Alan S. Walters	50
Sketchbook		52
Motor of the Month: Torp Jr.		54
Model of the Month: Speedster		56
Record Review		58
150 mph—Plus! (Part 2)	Harold deBolt	60
1950 Nationals Entry Coupon		71
Contest Calendar		74
The Last Word		89

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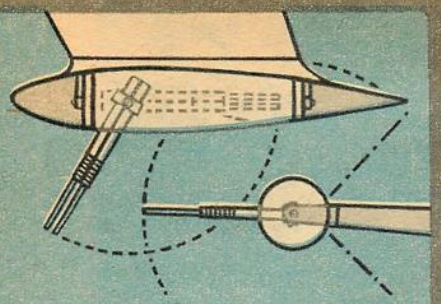
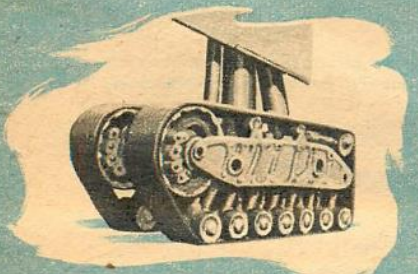


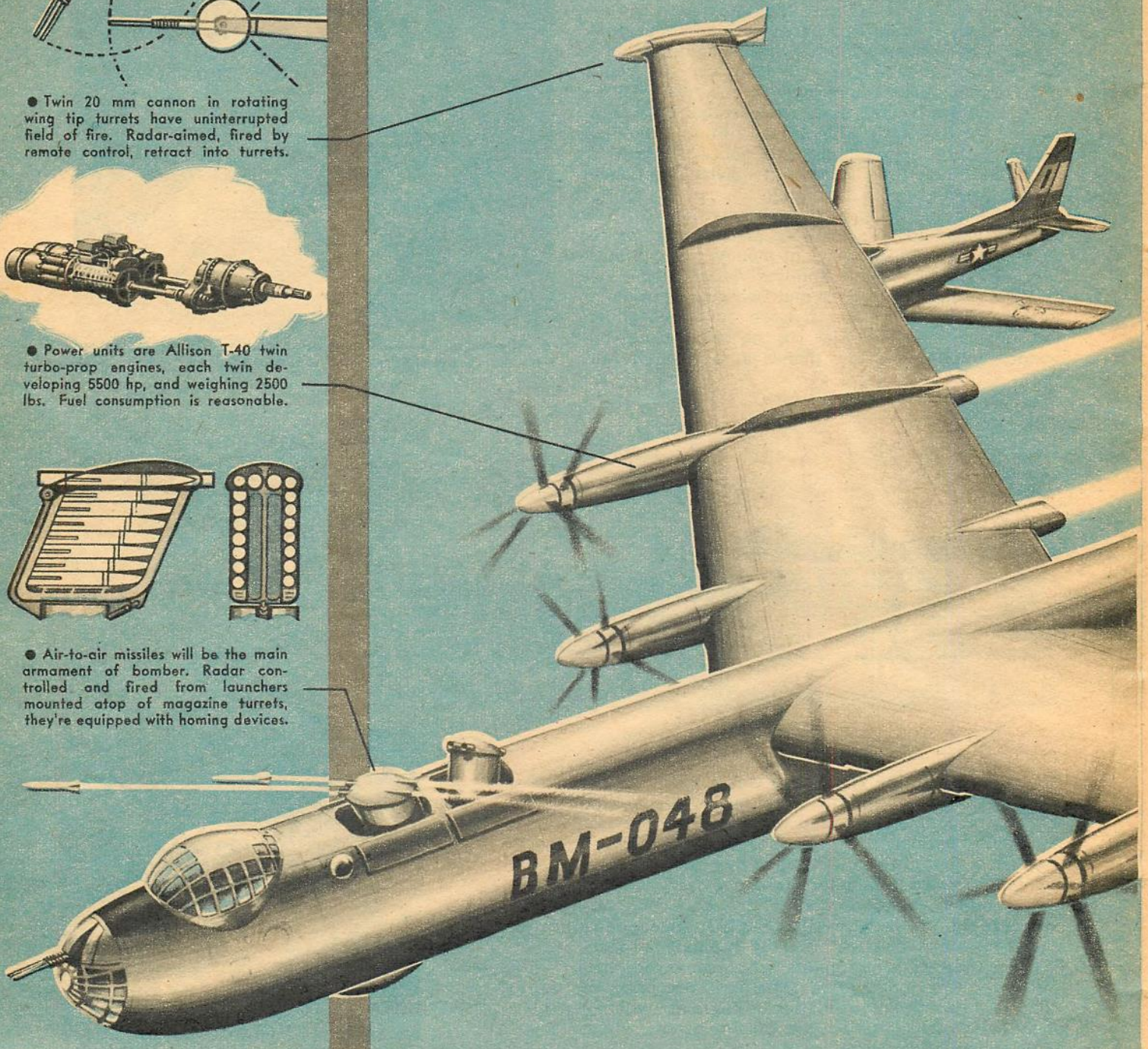
● Twin 20 mm cannon in rotating wing tip turrets have uninterrupted field of fire. Radar-aimed, fired by remote control, retract into turrets.

● Power units are Allison T-40 twin turbo-prop engines, each twin developing 5500 hp, and weighing 2500 lbs. Fuel consumption is reasonable.

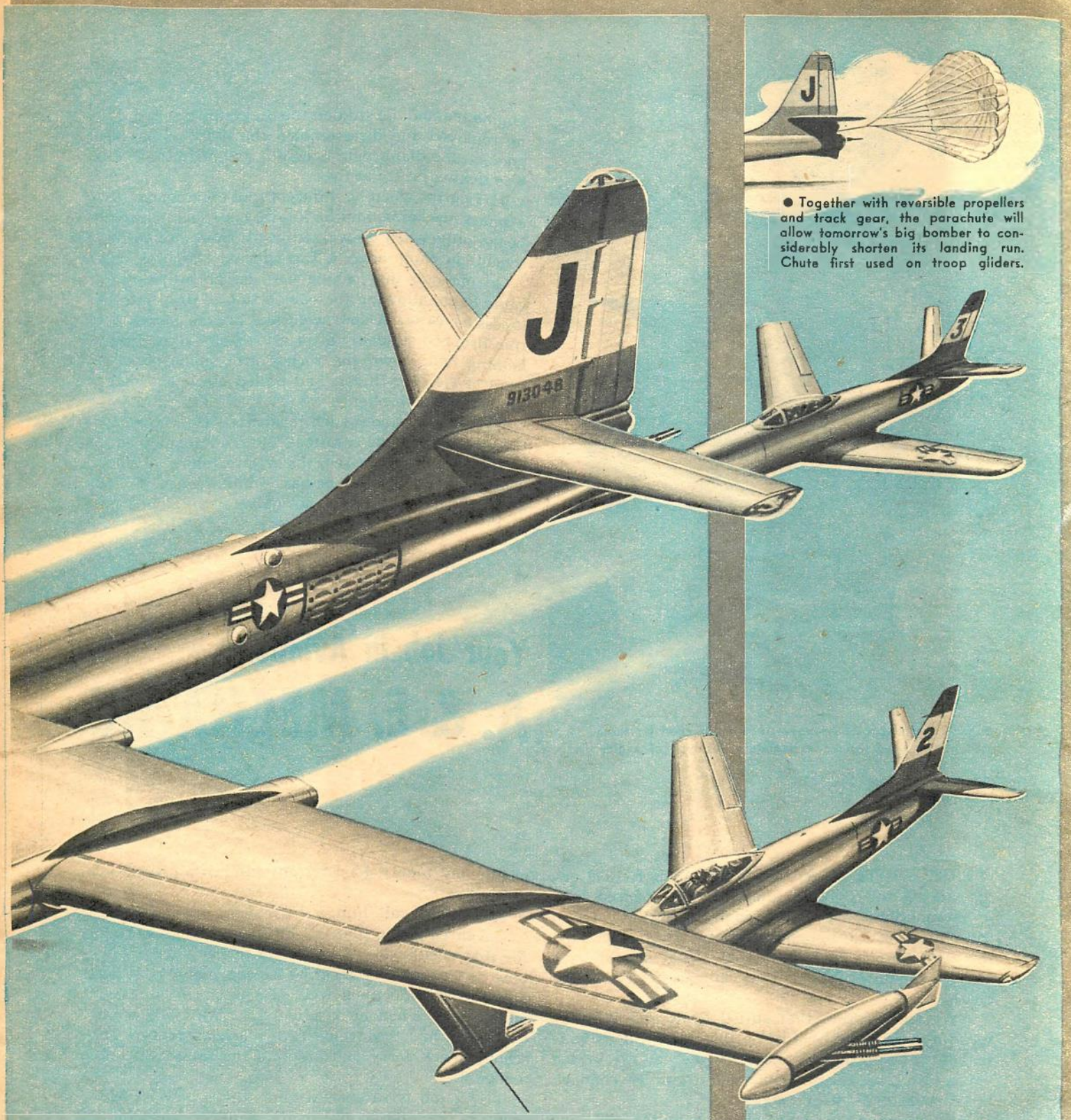
● Air-to-air missiles will be the main armament of bomber. Radar controlled and fired from launchers mounted atop of magazine turrets, they're equipped with homing devices.



● Tractor landing gear, now tested on B-36 will permit operation from smaller fields. Foot print pressure of each track is 56 lbs. per sq. in. as against 180 lbs. of standard gear.

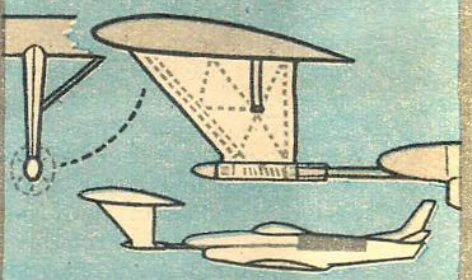


Next Step in Big Bombers?



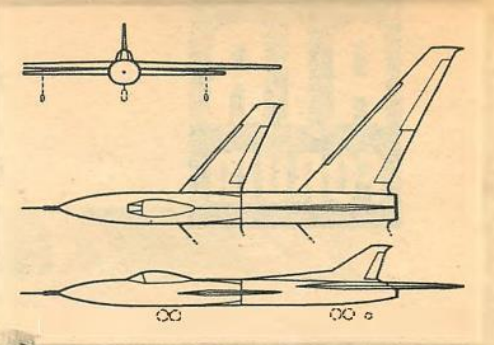
● Together with reversible propellers and track gear, the parachute will allow tomorrow's big bomber to considerably shorten its landing run. Chute first used on troop gliders.

Recently the Air Force announced serious consideration is being given to the souping up of the B-36 in order to increase its speed as well as range. The modifications are to include a swept-back wing and tractor turbo-prop engines. Since present-day jet escort fighters possess less than half the range of the Big Bomber, and the bomb-bay parasite fighter did not prove practical, final solution will probably be to tow fighters by means of a rigid boom into the combat zone, where they would disengage and protect their charges. The boom will serve also as means for refueling the fighters. Drawings by Frank Tinsley.

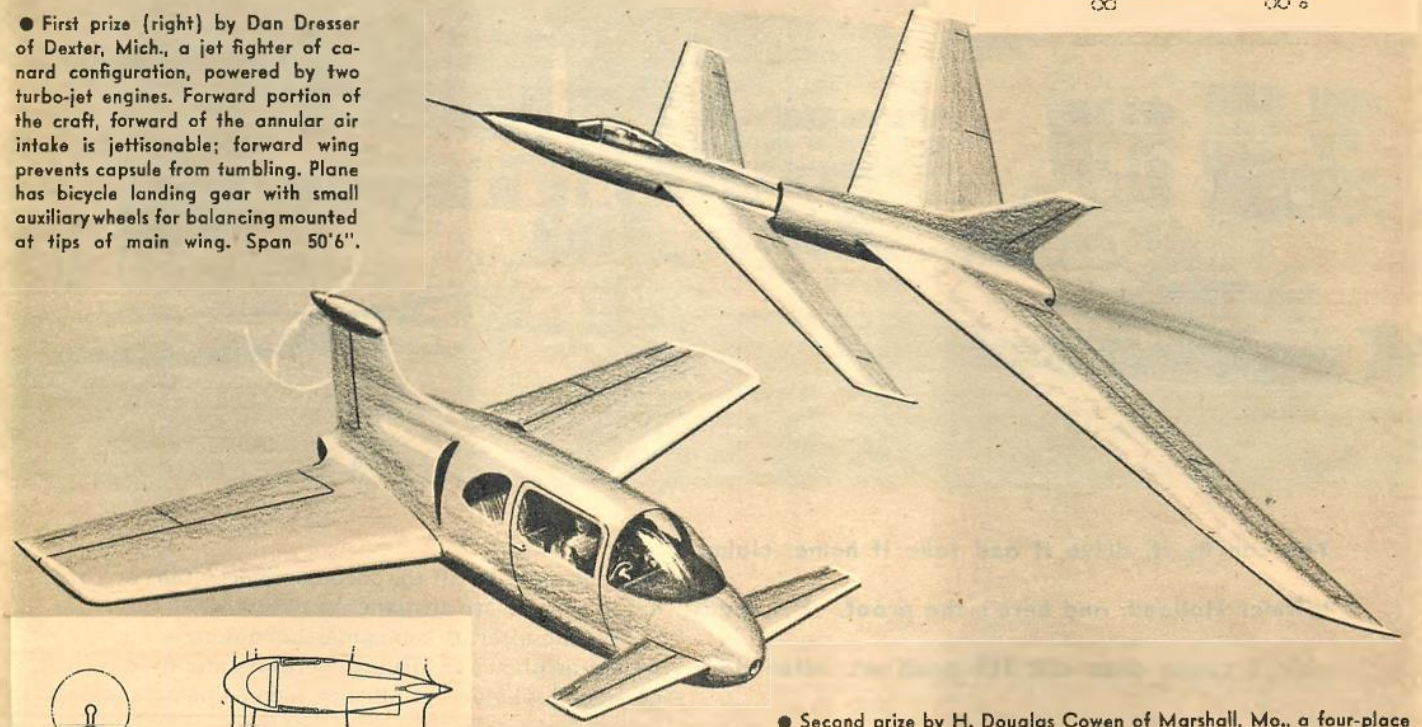


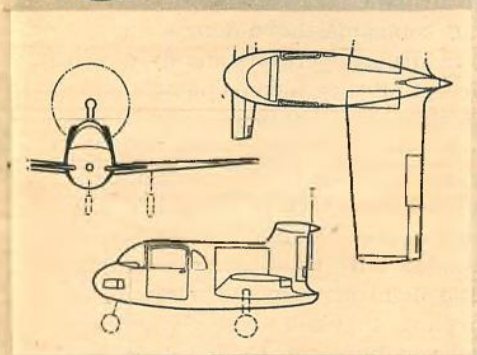
● The AF is testing the possibility of towing escort fighters with rigid link gear. Device has horizontal spring boom catcher, is streamlined, retracts into wing when not used.

Airmen of Vision
DESIGN COMPETITION

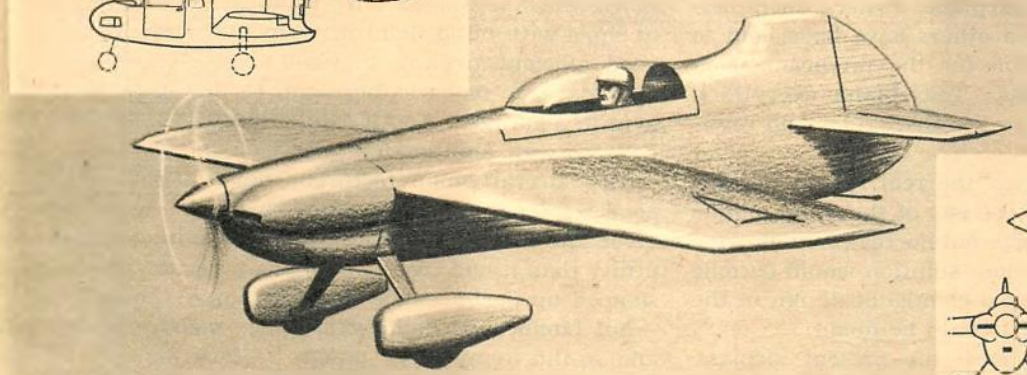


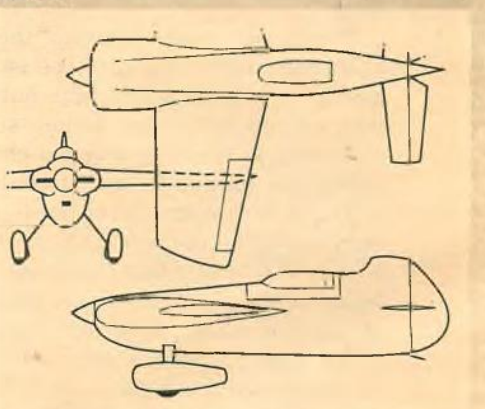
● First prize (right) by Dan Dresser of Dexter, Mich., a jet fighter of canard configuration, powered by two turbo-jet engines. Forward portion of the craft, forward of the annular air intake is jettisonable; forward wing prevents capsule from tumbling. Plane has bicycle landing gear with small auxiliary wheels for balancing mounted at tips of main wing. Span 50'6".





● Second prize by H. Douglas Cowen of Marshall, Mo., a four-place canard personal plane. Engine is located in rear behind passenger seats and drives a pusher propeller through vertical extension shaft and gear. High location of propeller permits the fuselage to be only one and a half feet from ground. The engine is 175 horsepower.





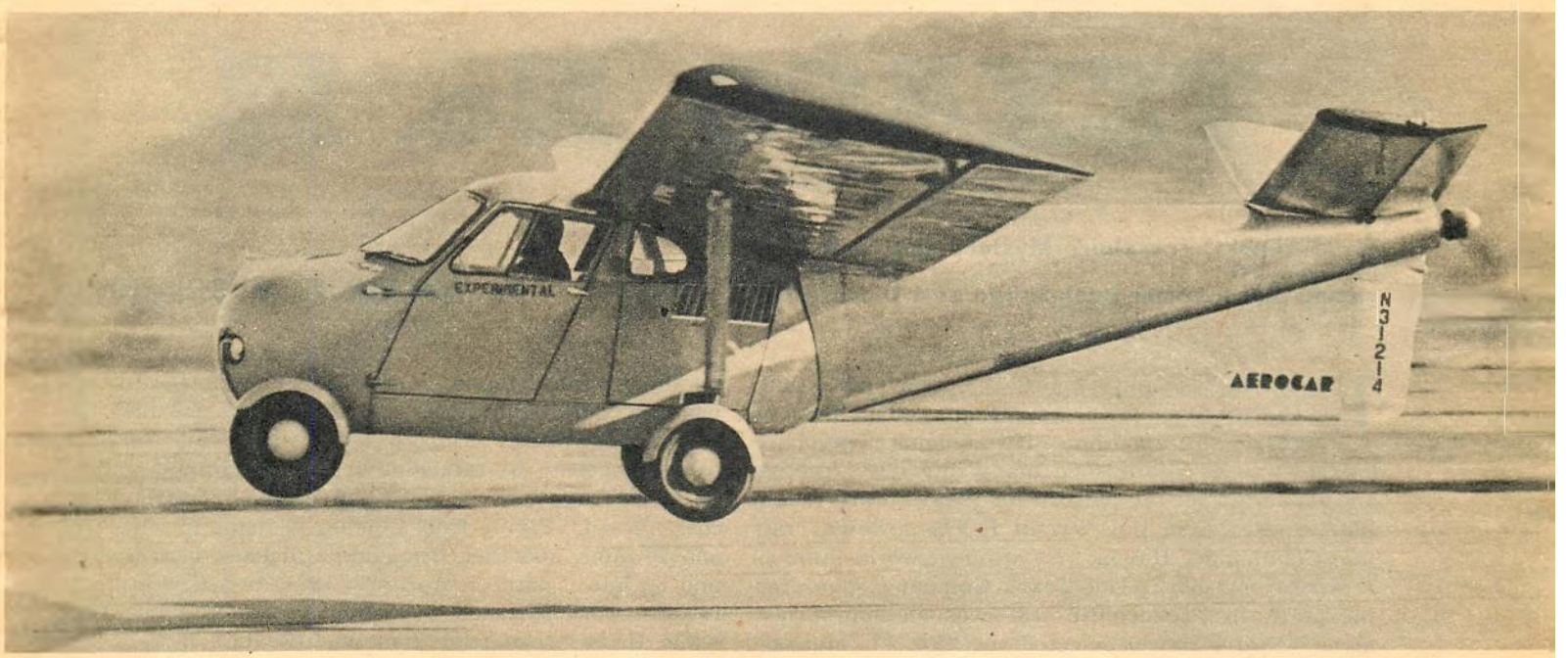
● Third prize, a small racing plane of 190 cu. in. class by Duncan Ferguson of Hempstead, L. I., New York. The little ship is of all-metal stressed-skin construction, with dural landing gear. Under the formula set up for this type of racing craft, forward and downward vision of plane is somewhat restricted. Span 18 ft., length 15'8".

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three-views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of the proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and judges. Designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should retain copies of all materials submitted. Mail entries to Airmen of Vision, c/o Air Trails, Box 489, Elizabeth, N. J. The editors regret because of large number of entries they cannot enter into correspondence on A of V.

flying never will be safe for the *average* pilot. I have been weathered-in time and again, sometimes for a week at a stretch, in different parts of the country and have noticed that the smart pilots sit and wait or leave the plane and take a train or bus—even though the plane may be equipped with all aids to navigation. For the average flyer, the airplane becomes as useless as snowshoes in Florida when the sun goes down or when the ceiling is on the trees.

This may sound stupid, but the private airplane doesn't really belong to its owner; it belongs to the airport nearest his home or the airport where storage is cheaper. That airplane is like a fine motorboat which is available for occasional pleasure rides in good weather, but must be left at some distant site to run up rent or be tied out at the mercy of the elements and souvenir hunters at some far-away lake. I have had gas and parts stolen from my planes when tied out, and wing tips damaged when hangared, and I know what is in the minds and hearts of those who own them and suffer such inconveniences and expense.

For years, I have studied the problems of roadability for airplanes and devised methods for folding their wings. Many engineers say it is impractical to carry the wings along on the highway and then home—but, I have driven my Ercoupe (complete) through the heavy tourist traffic of Miami, Fla., and through the narrow streets of downtown Mobile, Ala., and other places with as much ease as you would a car. Mrs. Gladys Pennington and Ellen Gilmour drove it 100 miles in five hours after dark in a heavy rain and crosswind from Jacksonville to Daytona Beach, Fla. This is no speed record, but it does prove that the complete airplane can be driven safely on the highway, and it must be (*Continued on page* 61)



A plague on AT's Clubster, cries Molt Taylor of Washington; the Aerocar is the answer, says he

THE "Aerocar" above, designed by Moulton B. Taylor and built by Aerocar, Inc., Longview, Washington, is a new all-metal "Flying Automobile." The automobile section of the prototype has already completed more than eight months of road work with thorough satisfaction, and the flying unit is at present undergoing flight tests with equal success. Conversion from automobile to aircraft may be accomplished in one minute. The flight component may be left at home or at the airport, or if preferred, may be towed behind as a trailer on retractable wheels set in the leading edge of the wing.

In the air, the Aerocar has a cruising speed of more than 100 mph and on the road a top speed of 50 mph. A 100 hp Franklin engine powers both components; the flying unit by means of a drive shaft from the automobile through the tail. The propeller is at the rear in pusher position. The Aerocar seats two and has a 14 cu. ft. baggage compartment. Service ceiling is 12,000 ft. and air range over 300 miles. Wingspan is 30 ft. and length 21 ft.; while as a car-trailer combination on the ground the length is 24 ft. Maximum road horsepower is 30. (*Continued on page* 62)

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Pictorial

APRIL 1949

25 CENTS

ARE SUPERSONIC BIPLANES NEXT?

AIR TRAILS Pictorial

APRIL, 1949 • VOL. XXXII, NO. 1

The subject of this month's cover is the Chance Vought XF7U-1 Cutlass, Navy's new shipboard fighter embodying the latest in aviation science—such as the delta-shaped wing, afterburners to give engines extra power boost, and Metalite sandwich construction. Speed, over 600.

THE READERS WRITE:

New Sailplane Records

Sirs:

I'm glad you were able to make use of the information I sent you on the X-1 (in your February letters column). Perhaps your readers will be interested in some new and important events in the field of soaring.

The sport of riding the rising currents of air in sailplanes has recently received an additional boost with the establishment of two U. S. altitude records. On January 1, 1949, John Robinson, of Altadena, Calif., reached the highest altitude yet attained by an American glider pilot when he soared his single-place white and red sailplane "Zanonia" above the towering Sierra Nevada Mountains, between Bishop and Muroc, Calif., to an absolute altitude of 33,300 feet. His free flight altitude, counted from the height of his release from the tow plane, was 24,000 feet—6,500 feet higher than the official U. S. altitude record established on July 4, 1939, by Robert M. Stanley, of Buffalo, N. Y.

Robinson rose to this height on updraft generated by the "standing wave," a comparatively little-known meteorological phenomenon found in the lee of high mountains and caused by the bounce of a strong wind spilling over the range. This new soaring technique holds a promise of altitudes well above those reached by Robinson, as strong lift produced by the "standing wave" has been traced to altitudes of oven 40,000 feet. In order to survive in the rarified atmosphere of this altitude, Robinson's sailplane was equipped with oxygen, which he had to use for three hours. The record is still considered unofficial, pending homologation by the Soaring Society of America and approval by the National Aeronautic Association.

Another sailplane altitude record—for two-place gliders—was established by William Briegleb and Dr. Thayer Smith on (*Continued on page 9*)

Letters to the Editors

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IN THIS ISSUE:

V-2, THE NOSEY MISSILE		18
ARE SUPERSONIC BIPLANES NEXT?	Alan Pope	21
WE FLY THE CESSNA 170	William Winter	24
THE GREAT "ZEKE" MYSTERY	David A. Anderton	26
AIR PROGRESS: THE BOEING STORY	Douglas Rolfe	28
PHOTO COMPETITION		31
GOODYEAR ROUND UP—III		32
NORTH AMERICAN FURY	Alfred Owles	33
C.A.P. NEWS		34
OFFICE IN THE AIR	Irving Wallace	37
MR. EHLING'S "EASY" STUNT MODEL	Frank Ehling	40
RADART	Francis McElwee	43
AIRSPEED AMBASSADOR	H. A. Thomas	46
CATAMOUNT	Dick Everett	49
INFANT PURSUIT	Don R. James	50
WHIRLAWAY "C"	Don W. Newberger	63
VARIABLE PITCH MODEL PROP—Part I	John D. Waugh	64
MODEL OF THE MONTH: STUNTWAGON		66
PANTHER		68
RECORD REVIEW		70

DEPARTMENTS

Showcase		10
Development Highlights		14
Air Notes		16
Solo Club		30
Airmen of Vision		36
Dope Can	Conducted by Val A. Luce	38
Report from Washington	Russell W. Nichols	39
Sketch Book		48
The Last Word		110

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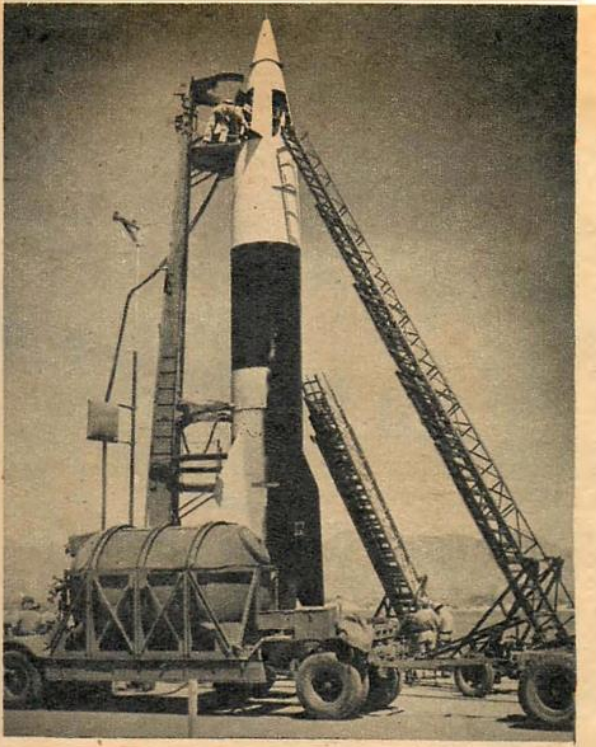
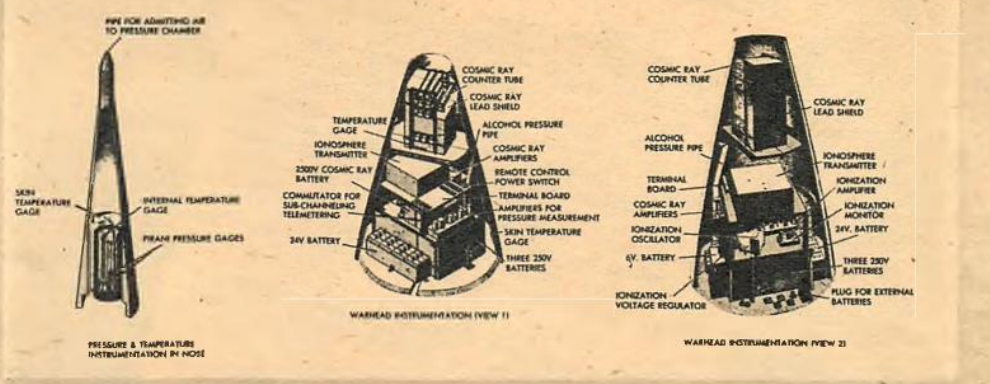
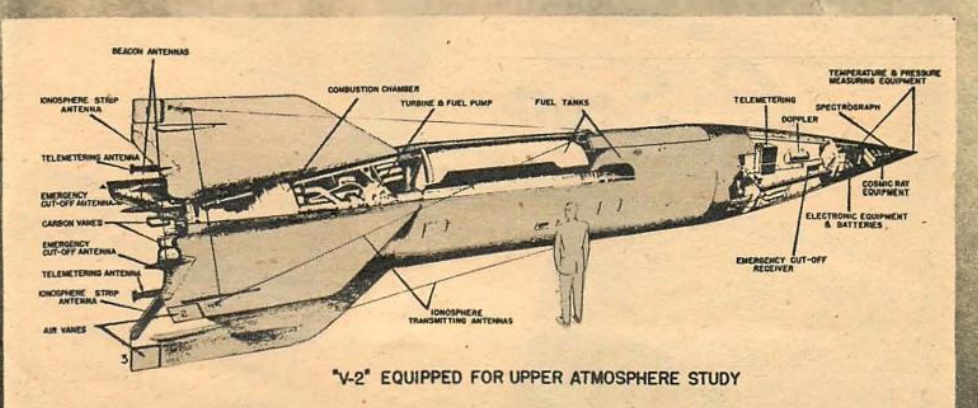
V2 the Nosey Missile





A FORMER weapon of destruction is now serving as an aerial probe to wrest scientific secrets from the upper atmosphere. At the Army Ordnance Proving Grounds, White Sands, N. M., scientists have been sending up into the ionosphere German V-2 rockets equipped with scientific instruments located in what used to be their deadly warhead. Highest altitude reached by the V-2 was 114 miles. Telemetering equipment communicates to the ground data obtained on: cosmic rays; thickness of ionized layer of atmosphere affecting radio communication; the sun's spectrum in ultra-violet region—to obtain better knowledge of its structure; temperatures; and pressures. Much information thus obtained has until now been based only on theory. Diagram above (left) shows nose section of V-2 with instruments. Directly below nose comes "warhead" instrumentation shown in cutaway.



"V-2" EQUIPPED FOR UPPER ATMOSPHERE STUDY

AIR TRAILS
APRIL, 1949

Are Supersonic BIPLANES next?

By ALAN POPE

IF YOU have a secret love for those old two-wing jobs, the ships that were almost the only ones in the sky from 1914 to 1925, don't give up hope of seeing them again. Much evidence we have at the present time indicates that biplanes may be back. Not in the old strut and wire form we remember so well, but in a modern 1950 version, capable of not less than 1,000 miles an hour, and, if you want a top limit, probably not more than 2,000.

What am I hinting at? Well, supersonically a very special type of biplane with very special airfoils and a very special gap between the wings appears to be promising in the range given above. Here's the complete story:

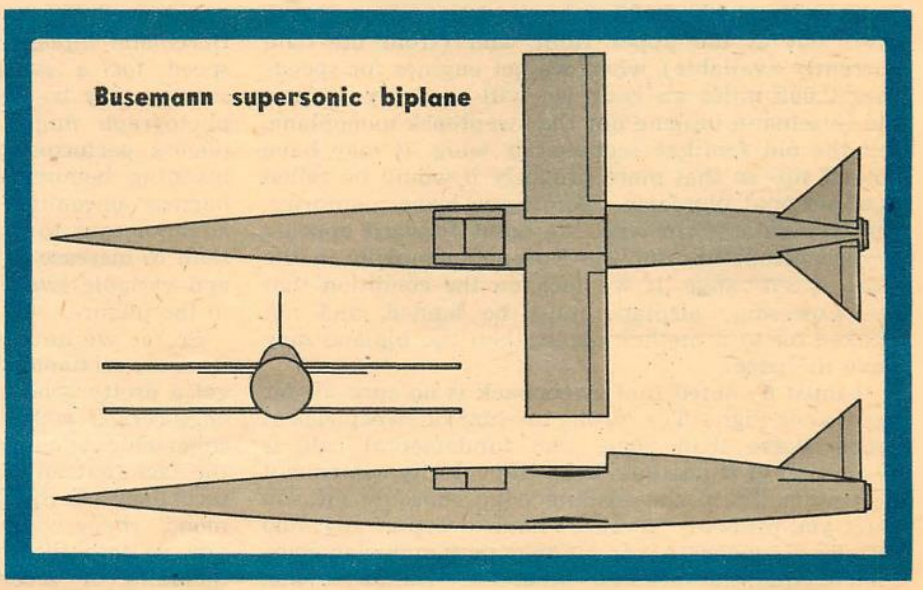
As you have read in Air Trails many times (Sweepback—The Supersonic Shape, by Richard G. Naugle, February 1948, *et al*) an airplane traveling at supersponic speeds will have shock waves at leading and trailing edges of the wings, and from the nose of the fuselage. Their presence is explained by the fact that the air ahead of the wings is "unwarned"—the wing is moving faster than its pressure waves—and it violently collides with the air instead of gently pushing it aside. Naturally, these shock waves are not free, by a long shot. For a very thin wing of about the size needed for a pursuit plane they require about 7,000 horsepower at 1,000 miles an hour at sea level. The reason they use all this power is that besides making a high pressure region over the front of the wing which tries to hold it back, the shock waves make a low pressure region over the back of the wing which effectively sucks it back. (The subsonic wing doesn't act that way: it has low pressure regions on both front and back which cancel out.)

Now then, sometime around 1935 Dr. Adolph Busemann (a German supersonic expert now in this country) considered the problem and came up with a biplane reflection system that mirrored the high pressure waves of the upper wing onto the back of the lower wing where they cancelled out the normal low pressure region. The lower wing similarly improved the upper wing.

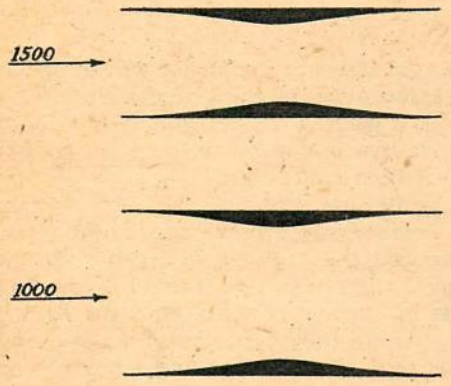
Through lack of equipment and time the Busemann biplane was not then widely tested—and indeed was not then needed. It has not been thoroughly tested yet. But the principle is sound, and appears far-reaching in the speed range given above. Early doubts that the air would go between the wings at a supersonic rate have apparently been dispelled by recent tests. An Italian supersonic expert (also in this country) told me not long ago that he felt the Busemann biplane had very great promise. Since he had run some wind tunnel tests on it his opinion is more than a guess.

The Busemann biplane will differ from the older biplanes mainly in the gap between the wings (which will be small by old standards) and the fact that for best results a given gap is right for one speed only.

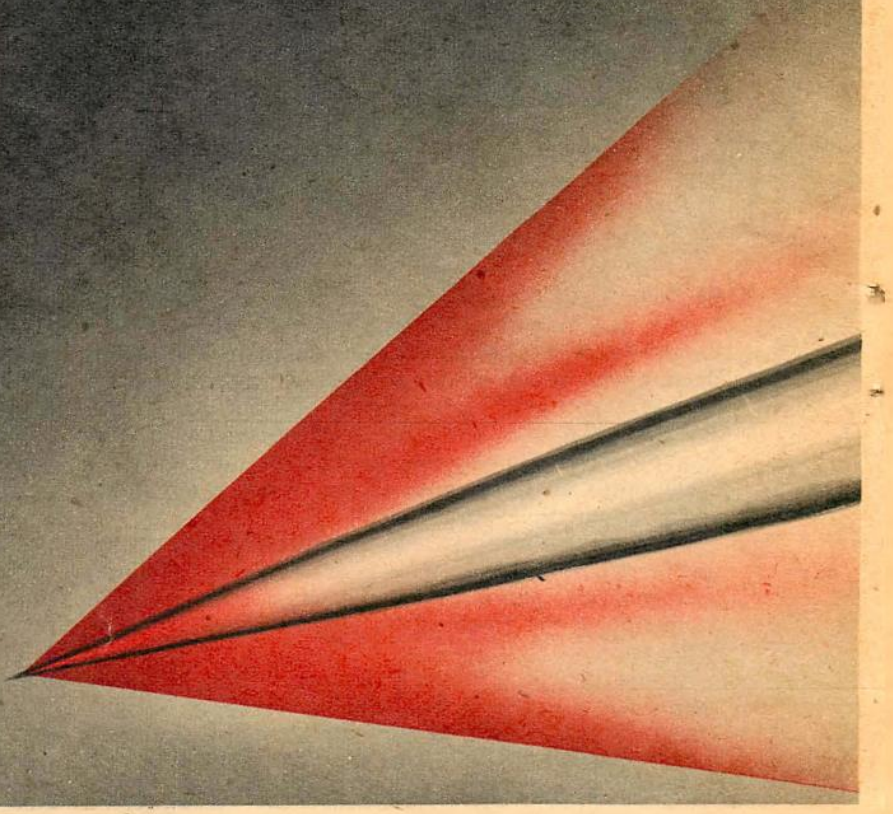
● The author, Mr. Pope, is Associate Professor, Daniel Guggenheim School of Aeronautics, Georgia School of Technology, and has contributed articles on wind tunnel procedure in past issues. At right is artist's sketch of supersonic biplane configuration proposed by Adolph Busemann. As the article points out, theory behind this design presents interesting possibilities. One drawback to such craft would be that a moment's study or a photo would indicate to "enemy" observers the exact speed at which the biplane was designed to operate. Varying gap for different speeds for the Busemann "bipe" are sketched on the next page together with some of the supersonic airfoils now under consideration or test. Whatever the ultimate result, this design is of special significance.



• Supersonic airfoil shape is still unsettled. These being considered. Leading edges, left.



• Size of gap for supersonic biplane sets speed. Top, 1,500 mph; bottom 1,000 mph



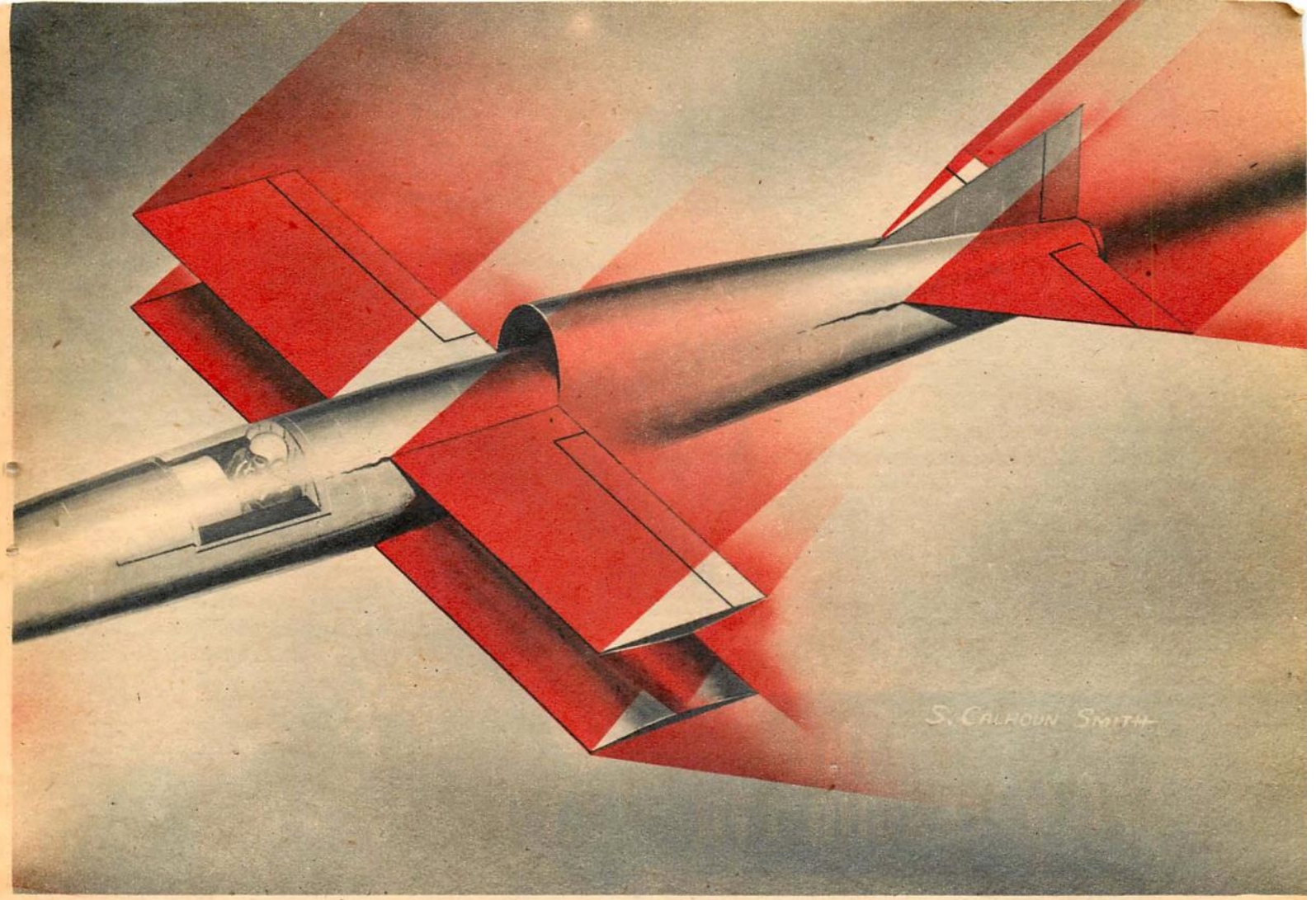
That is, the waves cancel only at what is called the design Mach number. For example, the right gap for a 5-foot chord will run about 1.25 feet at twice the speed of sound (1,522 mph at sea level, 1,324 mph at 40,000 feet). Thus the biplane is fairly critical, although near the design speed the waves nearly cancel.

To be fair and state the problem in its proper light, we must also note that sweepback looks very promising in the 1,000-2,000 mile-per-hour range. But it gives out at the upper limit, and (from the data currently available) when we get engines for speeds over 2,000 miles an hour we will probably use not the Busemann biplane nor the sweptback monoplane, but the old familiar rectangular wing. It may have cut-off tips so that more properly it would be called a trapezoidal planform. Before we leave planforms, the triangular form with the point forward appears a good competitor for the Busemann biplane in the same speed range. If we tack on the condition that the supersonic airplane must be landed, and not hooked on to a mother plane, then the biplane may have the edge.

It must be noted that sweepback is no cure-all for supersonic flight. The wrong amount of sweepback is much worse than none. The fundamental rule is twofold: (1) if possible, keep the velocity component perpendicular to the leading edge subsonic (if you can't you probably shouldn't have sweep at all); and (2) by all means never let that perpendicular component equal the speed of sound. For example, a wing with 45° of sweep will have an "effective" speed of 636 miles an hour when the plane flies at 900 mph, and its drag will be relatively low. At 1,075 mph the perpendicular component will be 761 (the speed of sound at sea level, standard air) and the drag will be extremely high. Probably less power will be needed to fly the 45° wing at 1,250 than 1,075! A wing without sweep would probably be better at 1,075 mph than one with 45° sweep.

The need of a particular gap for each speed of the Busemann biplane, and the existence of a difficult speed for a sweptback monoplane indicate that secrecy may be very difficult to maintain. A single photograph might be a dead give-away as to a plane's performance, and we can even picture an invading bomber fleet adjusting its speed to embarrass oncoming interceptors. It may be more advantageous to drop one's speed 100 miles an hour than to increase it 200. Variable gap for the biplane and variable sweep for the monoplane are definitely in the picture.

So far we have said little about the wing profile: its cross-sectional shape. At the present time you can get a pretty good argument going among a group of engineers if you come out strongly for one type of supersonic wing section. The trouble originates in the fact that an approximate theory which neglects secondary effects "proves" that a symmetrical "diamond" shape wing would have the least drag. When you go into the problem a little more thoroughly, including the secondary effects, it develops that the



diamond shape probably shouldn't be symmetrical, but should have its maximum thickness back of the midpoint.

Now both of the above conclusions have neglected the skin friction drag—and if you put that in, there is evidence that a section composed of two circular arcs would be best of all, unless, of course, the wing has sweepback, when the old familiar subsonic profiles become about as good as anything. So you see that depending on the viewpoint, one can pick almost any airfoil. The biplane, by the way, just needs a curved channel between the wings as shown in the sketch. Possibly it could be improved by a little curve on the outside.

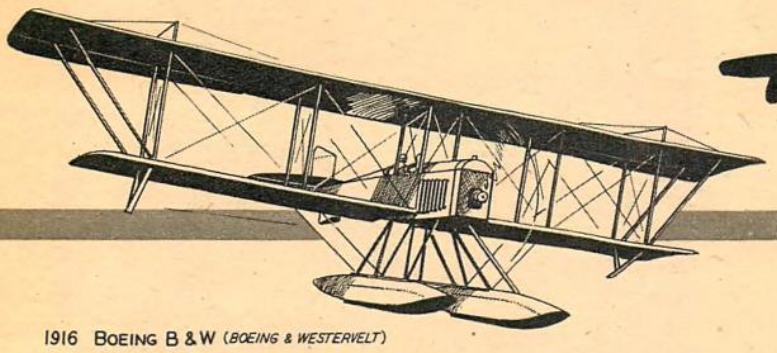
The ultimate selection of airfoil section depends on what is now a very hot subject: will the boundary layer be laminar or turbulent in supersonic flow under full scale conditions? Laminar flow has roughly one-tenth the drag of turbulent flow and normally would not be remotely expected, under the conditions of size and speed a supersonic airplane will have. But it has become apparent that the heat transfer that takes place in the boundary layer at supersonic speeds will help preserve laminar flow—in fact the head of one of the largest supersonic tunnels now in operation told me that turbulent flow was hard to create on a supersonic model. If this phenomenon extends to full scale it will be an immensely important benefit.

Every study on fuselage design has indicated that small cross-sectional area is a must for the supersonic airplane: so much so that for a specific storage space a needle shape appears quite probable, say a fuselage three feet in diameter and forty-five feet long, very pointed at the front. Such a needle-like affair would need about 10,000 horsepower at 1,000 miles an hour, or 13,500 horsepower if you increase the diameter to 3½ feet. (The figures are for sea level. At 50,000 feet they would be 1,517 and 2,050.) Thus designers are scratching their heads both over fuel consumption and storage space. I have heard men say of a new fuel, "I don't care how much it weighs—how *big* is it?"

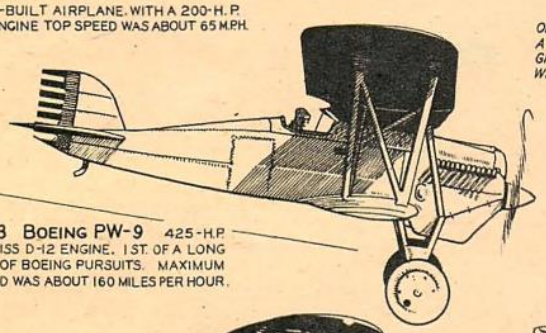
Sound information on the type of engine the supersonic airplane will have is not yet entirely available. The current feeling is that the turbojet may be used until 700 or 800 miles an hour, but probably not much faster, while most of the early supersonic flying will be done with the new ramjet engines. The reason for this conclusion is simply that the turbojet's compressor is hardly needed at those speeds, let alone higher ones.

The action of the ramjet may be described as follows: We are all well aware that the airstream presses upon the forward parts of the airplane. A simple forward-facing opening will show a pressure rise that rapidly increases with speed. Thus while the pressure rise is insignificant at 100 miles an hour, at 1,500 miles an hour enough pressure is available to yield a compression ratio of approximately 6 to 1—about what a car motor has. Thus by simply furnishing a tube for the air to enter and a passageway inside that slows the air down, we have the "compressor" without needing a (*Continued on page* 77)

Air Progress

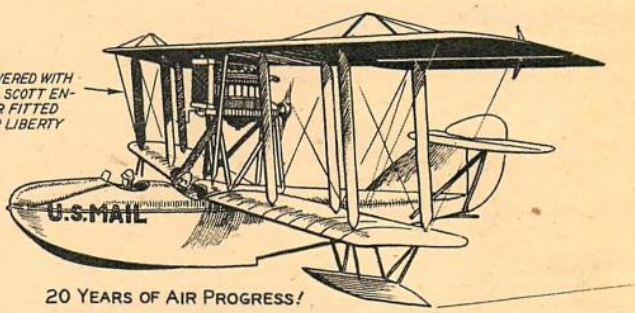


1916 Boeing B & W (*Boeing & Westervelt*)
FIRST BOEING-BUILT AIRPLANE. WITH A 200-H.P. HALL SCOTT ENGINE TOP SPEED WAS ABOUT 65 M.P.H.

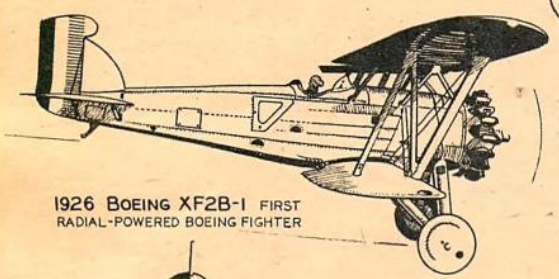


1923 Boeing PW-9 425-H.P. CURTISS D-12 ENGINE. 1ST. OF A LONG LINE OF BOEING PURSUITS. MAXIMUM SPEED WAS ABOUT 160 MILES PER HOUR.

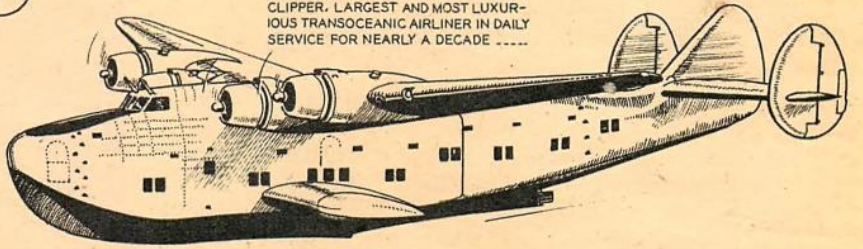
ORIGINALLY POWERED WITH A 200-H.P. HALL SCOTT ENGINE BUT LATER FITTED WITH A 400-H.P. LIBERTY

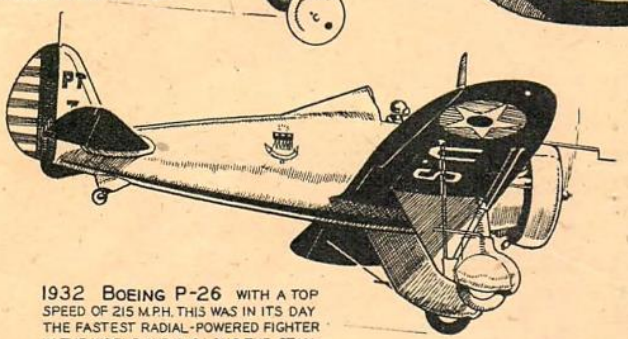


20 Years of Air Progress!
ABOVE, BOEING'S FIRST FLYING BOAT, THE 3-PLACE B-1 PRODUCED IN 1919, AND, BELOW, THE 1938 GIGANTIC B-314 CLIPPER, LARGEST AND MOST LUXURIOUS TRANSOCEANIC AIRLINER IN DAILY SERVICE FOR NEARLY A DECADE .....



1926 Boeing XF2B-1 FIRST RADIAL-POWERED BOEING FIGHTER





1932 Boeing P-26 WITH A TOP SPEED OF 215 M.P.H. THIS WAS IN ITS DAY THE FASTEST RADIAL-POWERED FIGHTER IN THE WORLD AND WAS LONG THE STANDARD SINGLE-SEAT FIGHTER OF THE A.A.F.

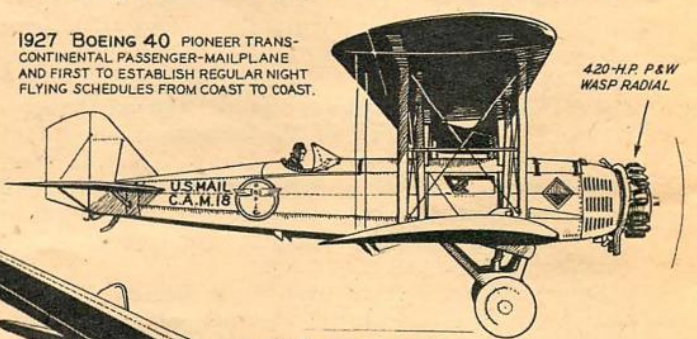
DOUGLAS ROLFE

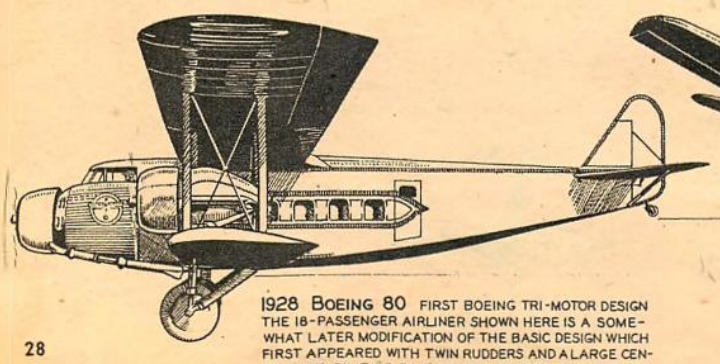
Bill Boeing built his first airplane in 1916 with the assistance of Conrad Westervelt. The B-W, as the plane was designated, was produced by a company which Boeing formed the same year—the Pacific Aero Products Company—the name of which was soon changed to its present title, Boeing Airplane Company. In 1919 Boeing produced the B-1, a three-place flying boat which flew the first international airmail route (between Seattle and Victoria) for nearly seven years. The company soon branched out into a bewildering variety of designs, most of which were the best of their kind in the world. Pursuits, mailplanes, giant flying boats, transports, and bombers rolled out

1925 Boeing Mail-Carrier
FIRST SPECIALLY-DESIGNED MAILPLANE PRODUCED BY THE BOEING COMPANY.

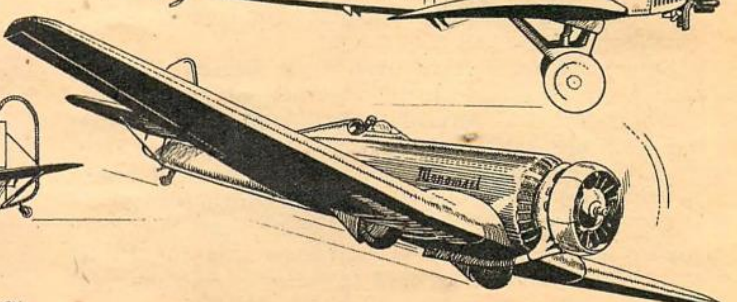
1927 Boeing 40 PIONEER TRANS-CONTINENTAL PASSENGER-MAILPLANE AND FIRST TO ESTABLISH REGULAR NIGHT FLYING SCHEDULES FROM COAST TO COAST.

420-H.P. P&W WASP RADIAL





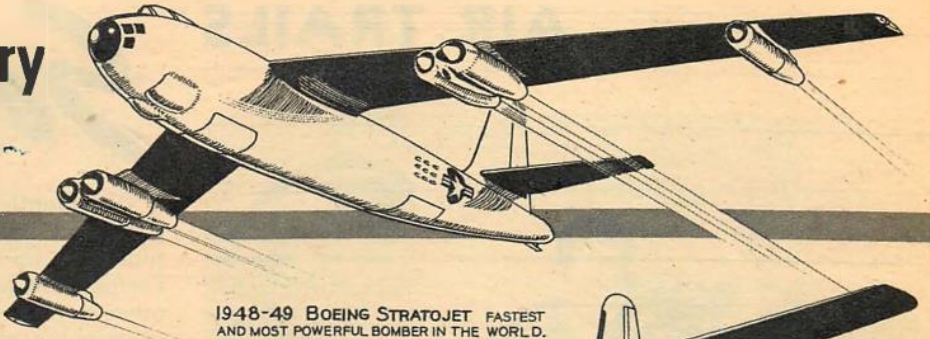
1928 Boeing 80 FIRST BOEING TRI-MOTOR DESIGN THE 18-PASSENGER AIRLINER SHOWN HERE IS A SOMEWHAT LATER MODIFICATION OF THE BASIC DESIGN WHICH FIRST APPEARED WITH TWIN RUDDERS AND A LARGE CENTRAL STABILIZING FIN. CRUISING SPEED WAS 115 M.P.H.



1930 Boeing Monomail 575-H.P. RADIAL ENGINE.
THIS ALL-METAL CANTILEVER LOW-WING MONOPLANE INDICATED A DEFINITE APPROACH TO PRESENT-DAY DESIGN.

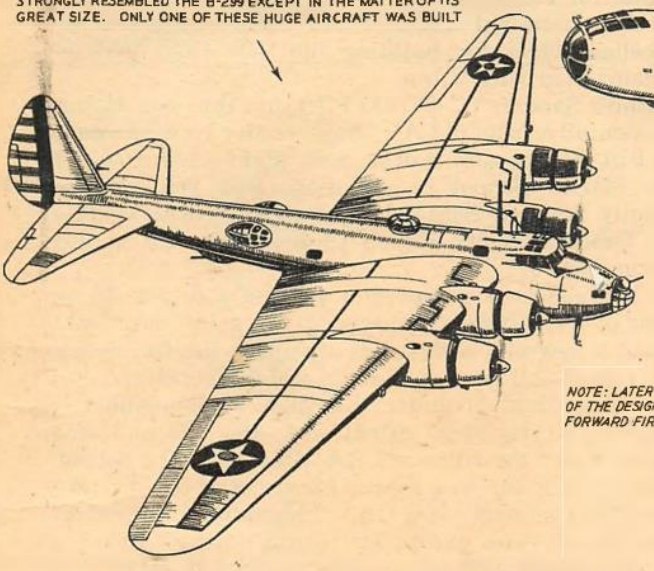
The BOEING Story

By DOUGLAS ROLFE

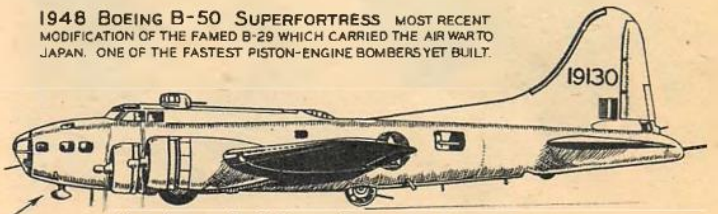


1948-49 BOEING STRATOJET FASTEST AND MOST POWERFUL BOMBER IN THE WORLD. COMPARE THIS DESIGN WITH THE 1916 BOEING!

1937 BOEING XB-15 GRANDPAPPY OF ALL "SUPERFORTS" TO COME THIS HUGE EXPERIMENTAL EXTRA LONG RANGE BOMBER STRONGLY RESEMBLED THE B-299 EXCEPT IN THE MATTER OF ITS GREAT SIZE. ONLY ONE OF THESE HUGE AIRCRAFT WAS BUILT

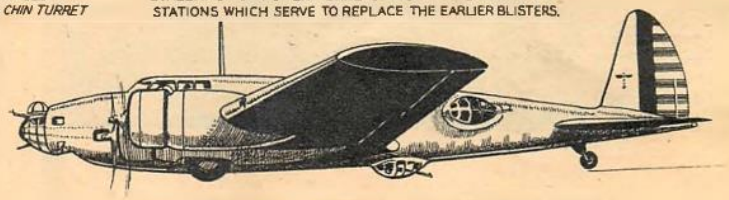


1948 BOEING B-50 SUPERFORTRESS MOST RECENT MODIFICATION OF THE FAMED B-29 WHICH CARRIED THE AIR WAR TO JAPAN. ONE OF THE FASTEST PISTON-ENGINE BOMBERS YET BUILT.



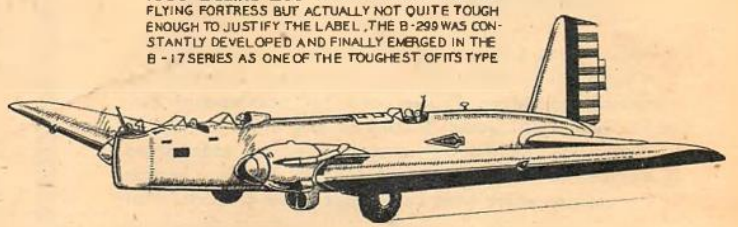
NOTE: LATER REFINEMENTS OF THE DESIGN INCLUDED A FORWARD FIRING CHIN TURRET

1941 BOEING B-17 FLYING FORTRESS BASICALLY A MODIFIED VERSION OF THE B-299 DESIGN. MORE OBVIOUS EXTERNAL DEVELOPMENTS ARE THE LARGE DORSAL FIN, INSTALLATION OF POWER TURRETS AND THE OPEN WAIST GUN STATIONS WHICH SERVE TO REPLACE THE EARLIER BLISTERS.

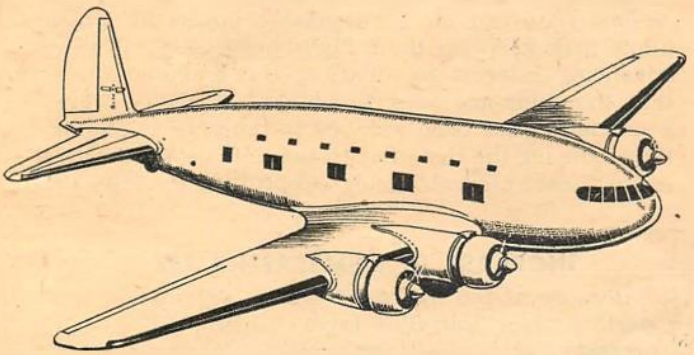


of the expanding Boeing plants. One design alone, the Boeing Monomail, may be said to have changed the whole picture of aviation. This sleek, streamlined all-metal monoplane was years ahead of its time, and since its production Boeing leadership in the transport field has rarely been surpassed. Boeing also developed the extra-long-range bomber to a point where today their B-50 stands practically alone in this field. The wartime achievements of their famed B-17's and B-29's will long be remembered. Today, like most aircraft manufacturers, Boeing is engaged in the problem of jet-powered flight and has already made notable contributions in this field.

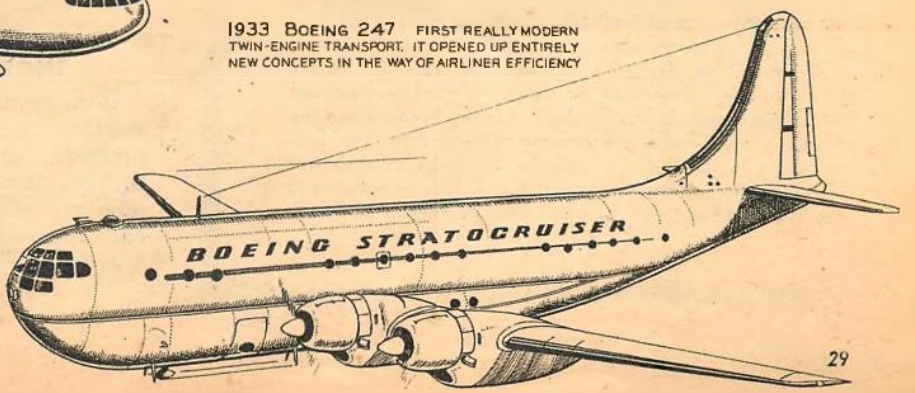
1935 BOEING 299 DIRECT ANCESTOR OF THE FLYING FORTRESS BUT ACTUALLY NOT QUITE TOUGH ENOUGH TO JUSTIFY THE LABEL. THE B-299 WAS CONSTANTLY DEVELOPED AND FINALLY EMERGED IN THE B-17 SERIES AS ONE OF THE TOUGHEST OF ITS TYPE



1931 BOEING YB-9 FIRST ALL-METAL TWIN-ENGINE BOMBER AND FASTEST IN THE WORLD IN ITS DAY. THE YB-9 MARKED BOEING'S DRAMATIC ENTRY INTO THE HEAVY BOMBER FIELD—A FIELD IN WHICH BOEING LEADERSHIP IS AN ACCEPTED FACT TODAY



1933 BOEING 247 FIRST REALLY MODERN TWIN-ENGINE TRANSPORT. IT OPENED UP ENTIRELY NEW CONCEPTS IN THE WAY OF AIRLINER EFFICIENCY

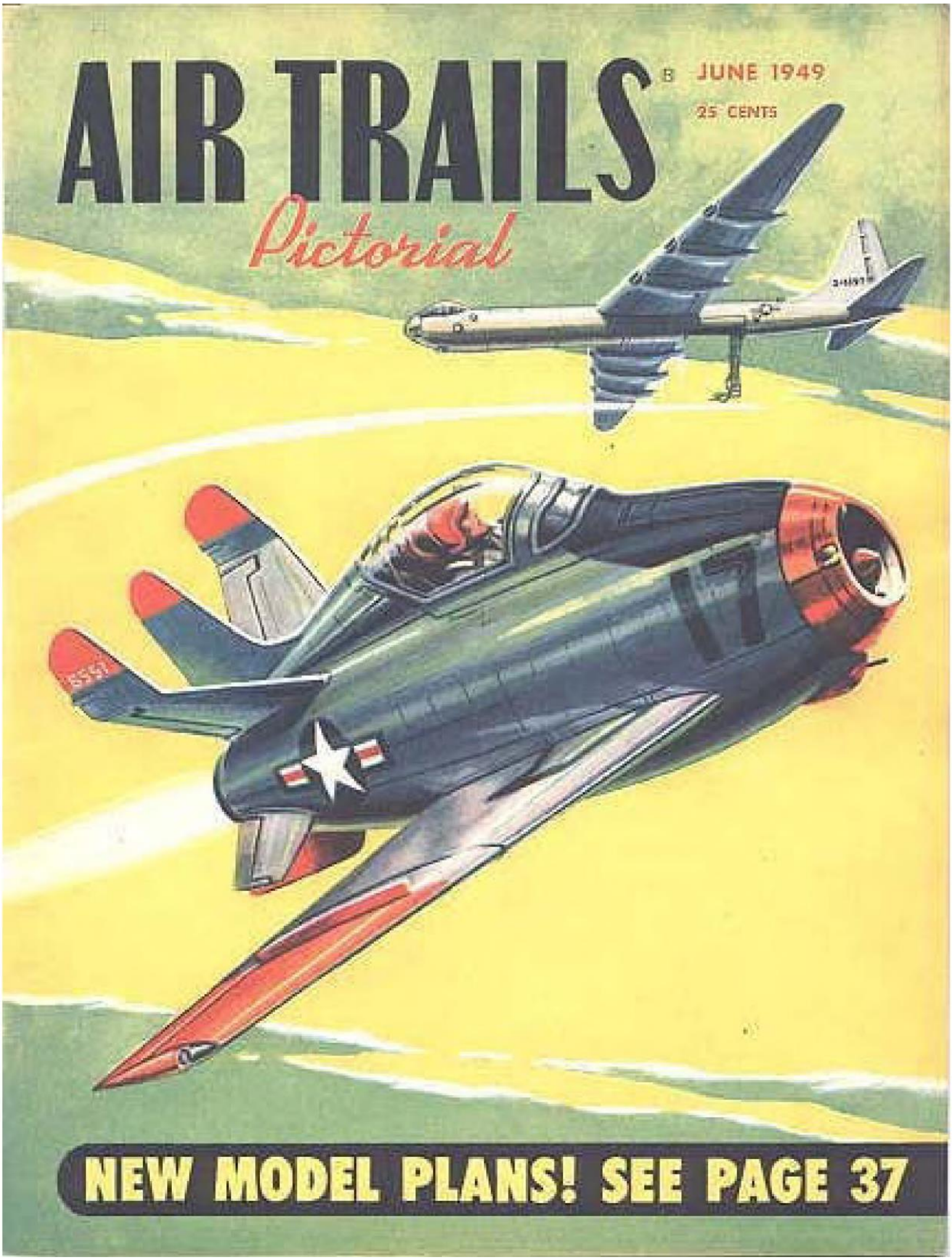


1939 BOEING 307 STRATOLINER (*ABOVE*) WORLD'S FIRST HIGH-ALTITUDE COMMERCIAL TRANSPORT WITH FULLY PRESSURIZED CABIN. DEPICTED HERE IS THE BASIC DESIGN. PRODUCTION MODEL DIFFERED IN HAVING A LARGE DORSAL FIN INSTEAD OF THE B-299 TYPE RUDDER ASSEMBLY AS ILLUSTRATED.

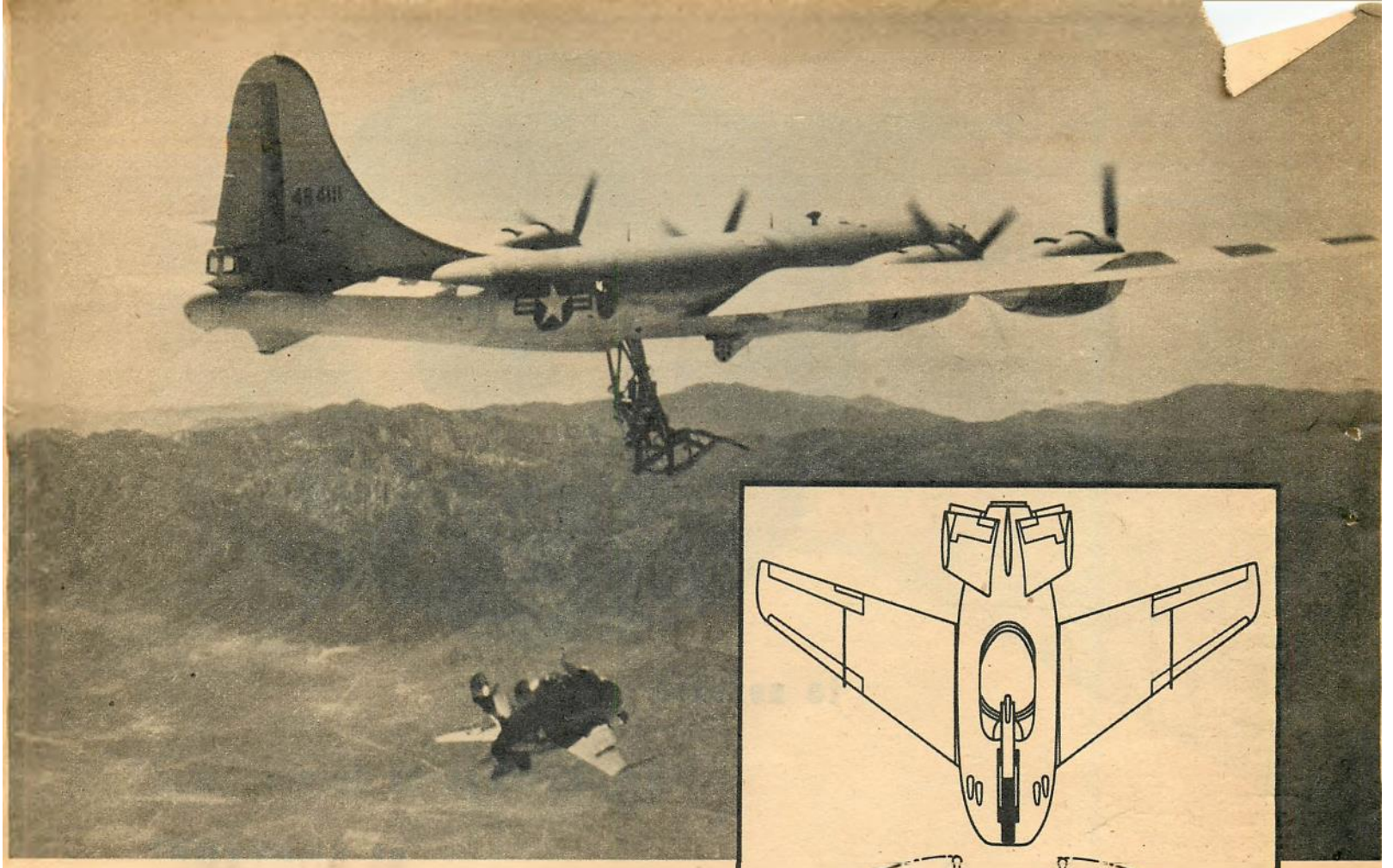
1947 BOEING STRATOCRUISER (*AT RIGHT*) THIS HUGE 60-114 PASSENGER DOUBLE-DECK TRANSPORT POWERED WITH FOUR 3,500-H.P. P&W ENGINES IS ONE OF THE LARGEST, FASTEST AND MOST LUXURIOUS AIRLINERS OPERATING ANYWHERE IN THE WORLD TODAY

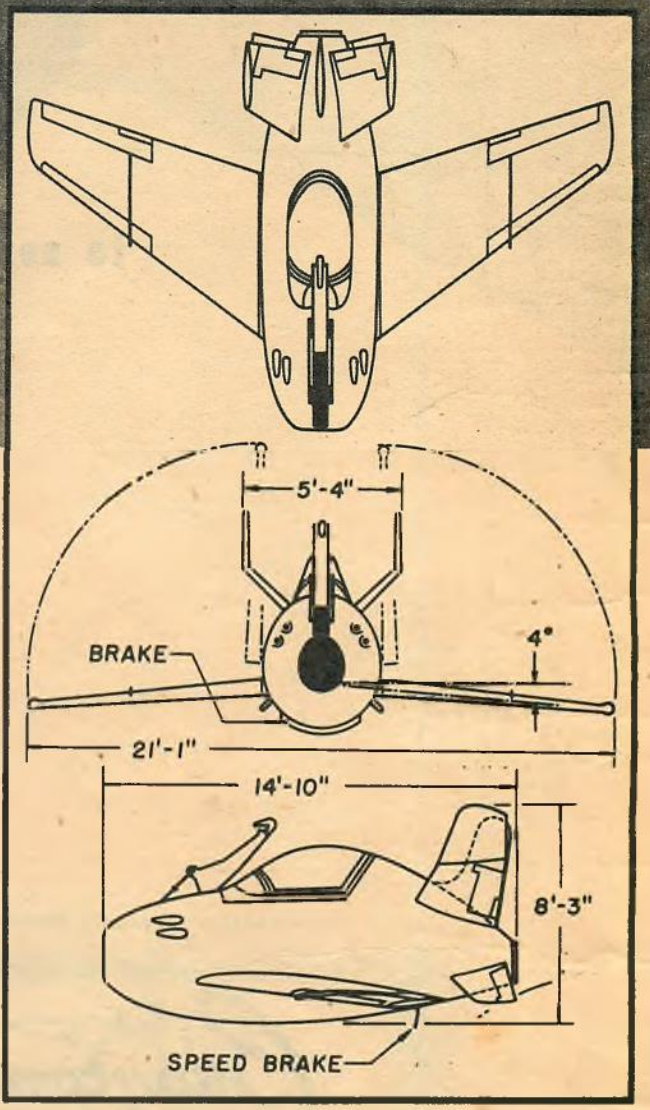
AIR TRAILS Pictorial

JUNE 1949
25 CENTS



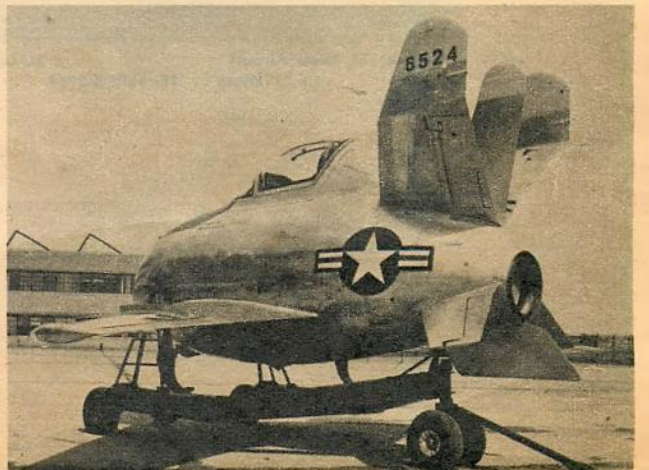
NEW MODEL PLANS! SEE PAGE 37





GOBLIN

ONE of the problems with jet fighters is their inordinate thirst for fuel, which prevents them from acting as escorts for our 10,000-mile-range bombers. But a solution for the protection of these bombers had to be found. A parasite fighter carried in the bomb bay of a bomber such as the B-36 was one possibility. When the bombers are attacked the parasites are released to fight off the enemy. Upon accomplishing the mission, they return, hook onto a special trapeze and are raised into the aerial hangar. The XF-85 "Goblin," shown here, designed and built by McDonnell Aircraft Corp., St. Louis, Mo., is the first and only one of its kind. It made its initial flight in August, 1948, flown by McDonnell's test pilot Ed Schoch. Although it suffered two slight mishaps during which it had to land on Muroc's lake bed at 170 mph, the XF-85 made a number of successful launches and hook-ons. In speed it is comparable to other jet fighters, and is powered with a J-34 (Westinghouse) jet engine with a 3,000-lb. take-off thrust.

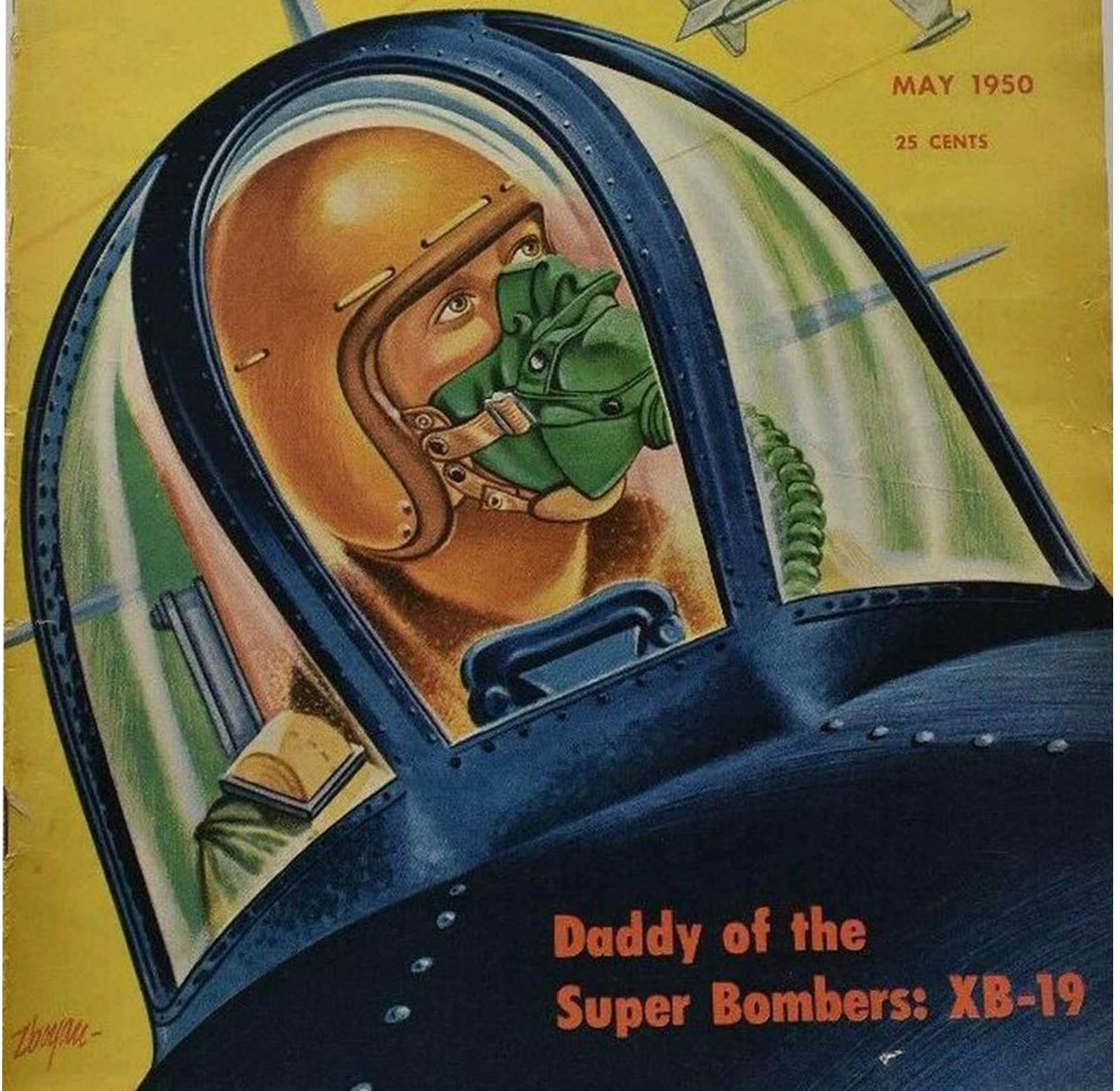


AIR TRAILS

Pictorial

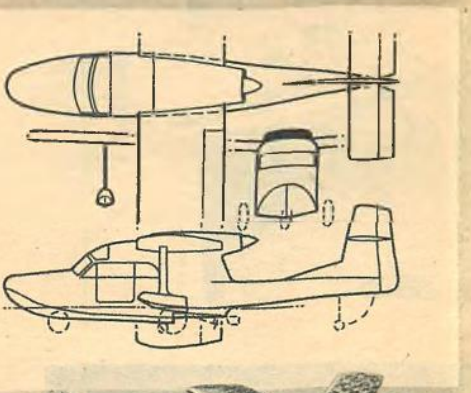
MAY 1950

25 CENTS

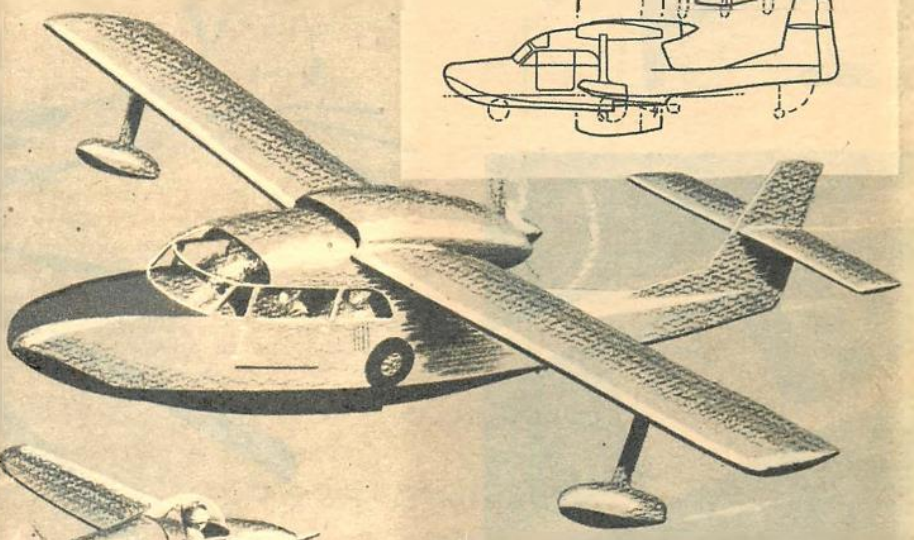


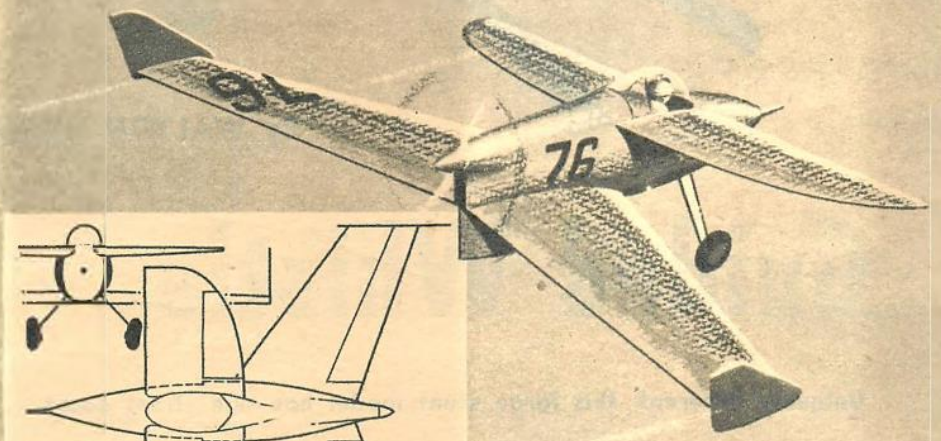
Daddy of the Super Bombers: XB-19

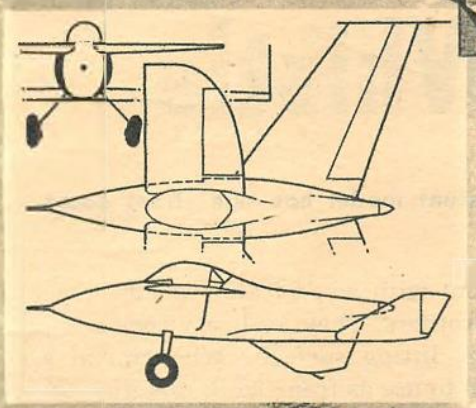
Airmen of Vision
DESIGN COMPETITION



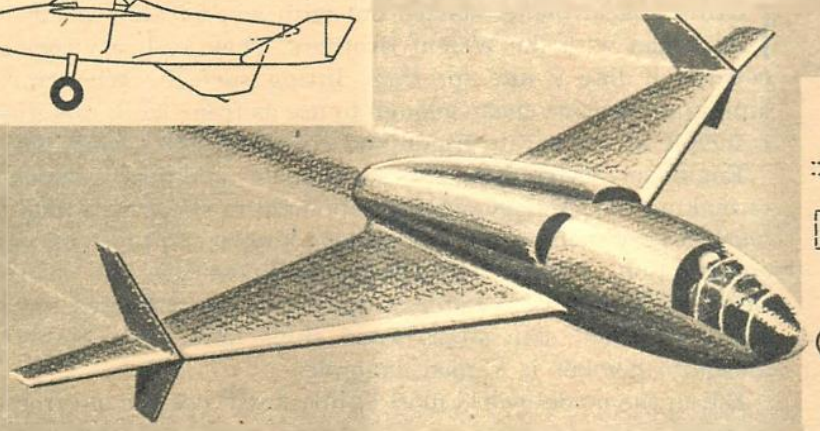
● First prize (right) by Donald Madison of Alexandria, Va.: the Airfibicle. A versatile craft which can be a plane, car or motorboat. The entire flying section which includes top of cabin, engine and rear fuselage section is removable, leaving a boatlike hull for ground or water transportation. A separate 26 hp engine powers the nonflying section. As a boat it has a water propeller; wheels retract.

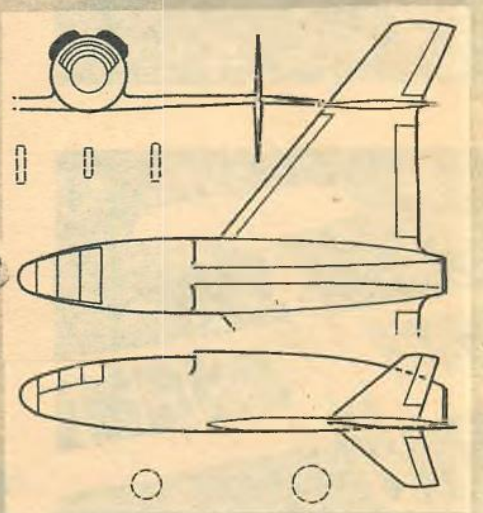






● Second prize (left) by Davis W. Jones of Glencoe, Ill., a midget racing plane of unusual configuration. The unusual feature of this design is the control surfaces on the main wing which combine elevator and aileron action while the movable surfaces of the front wing act as a flap. Take-off is made by depressing flap and trimming angle of climb with aft controls. Wing span is 16 ft., length 17 ft. Top speed 235, landing, 35 mph.





● Third prize by Brian M. Owens of Chicago, Ill., a tailless, jet-powered interceptor-fighter. Wing has 40° sweepback and is equipped with leading edge slots. Yawing moment is controlled with normal rudders set near wing tips. Tips have ailerons, elevators are located on inner section. Pilot lies in jettisonable cockpit.

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three-views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of the proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and judges. Designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports,) planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should retain copies of all material submitted. Mail entries to Airmen of Vision, c/o Air Trails, Box 489, Elizabeth, N. J. The editors regret because of large number of entries they cannot enter into correspondence on A of V.

AIR TRAILS® Pictorial

OCTOBER 1949

25 CENTS

EGG BEATER PARADE:

Pictorial History of U. S. Helicopters—see page 21

AIR TRAILS
OCTOBER, 1949

● First Air Corps helicopter, designed by Prof. Geo. de Bothezat, made a 2-min. 45-sec. flight in '23.

'COPTERS AT WORK:

● Air-sea rescue.

● Search for oil.

● Power-line survey.

● Pipe laying.

THIS WINGED WORLD:

Egg Beater Parade

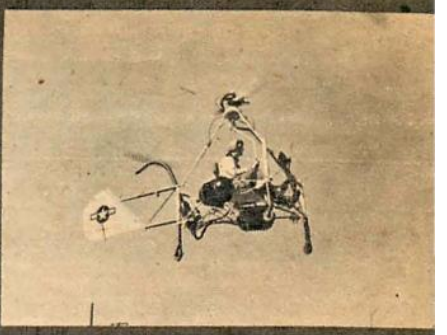
THE idea of rotary wing aircraft is probably as old as man's attempt at flight. Famous Italian scientist and poet Leonardo da Vinci made a number of designs for this type aircraft as far back as the 16th century. Ever since, a number of helicopters have been designed and built by engineers, mechanics and visionaries all over the world.

It was not until the early twenties that Prof. George de Bothezat in the U. S. A. and Louis Breguet of France came up with the first rotary wing aircraft which achieved actual flight. Difficulty of controlling these machines caused

● Crop dusting and pest control are some of the most important functions of the versatile 'copter.

● Sikorsky S51 four-place helicopter, powered by a 450-hp Pratt & Whitney. Speed, 103 mph.

● Hiller 360: Carries three side-by-side, blades controlled by servo tabs. Engine, 170-hp Franklin.



● McDonnell "Little Henry" features ramjets at its wing tips.

temporary abandonment of helicopter projects. In the meantime, in Spain Juan de la Cierva brought out his very successful autogiro design and a large number of these craft were built and flown both here and abroad.

The *autogiro* differs from the helicopter by virtue of having free-rotating blades which turn by the force of air exerted on them due to forward or vertical motion of the plane, the blades producing only lift, forward thrust being furnished by a conventional propeller. The *helicopter's* rotor blades are driven by an engine, and both lift and thrust are produced by the blades. Early autogiros were equipped with short stub wings featuring ailerons and conventional tail surfaces for controlling flight altitude, but they proved inefficient at low speeds and in the late thirties direct control autogiros made their appearance. These aircraft had tiltable rotor heads controlled by a stick in the cockpit which eliminated the stub wings and elevators. This controllable rotor head gave impetus to further development of the helicopter in this country, and in 1940 the Platt-LePage Aircraft Co. was granted the first government contract to develop a military helicopter, the XR-1. At the same time Igor Sikorsky flew his first experimental machine the VS-300 which set the style for most helicopters with its anti-torque propeller located at rear of fuselage.

Military development contracts and orders during the last war were largely responsible for the fast growth and maturing of the direct lift aircraft.

Shown here are most of the important civilian models. Many have been abandoned, but during their development and testing stages they produced much significant data.

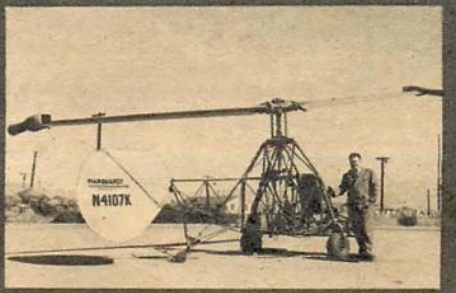
● Sikorsky VS-300: First prototype featured lifting tail rotors as well as anti-torque rotor.

● Bell Aircraft helicopter 47D-1: Bell is one of largest helicopter builders in the country.

● A significant early model of Hiller's 'copter, no longer made.

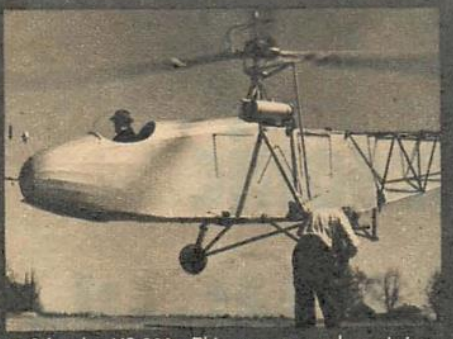
● Sikorsky S-52-1: This machine recently set a helicopter world speed record of 129.6 mph.

● Another jet helicopter, this one by Marquardt Aircraft. Pulse-jet engines weigh only 20 lbs.



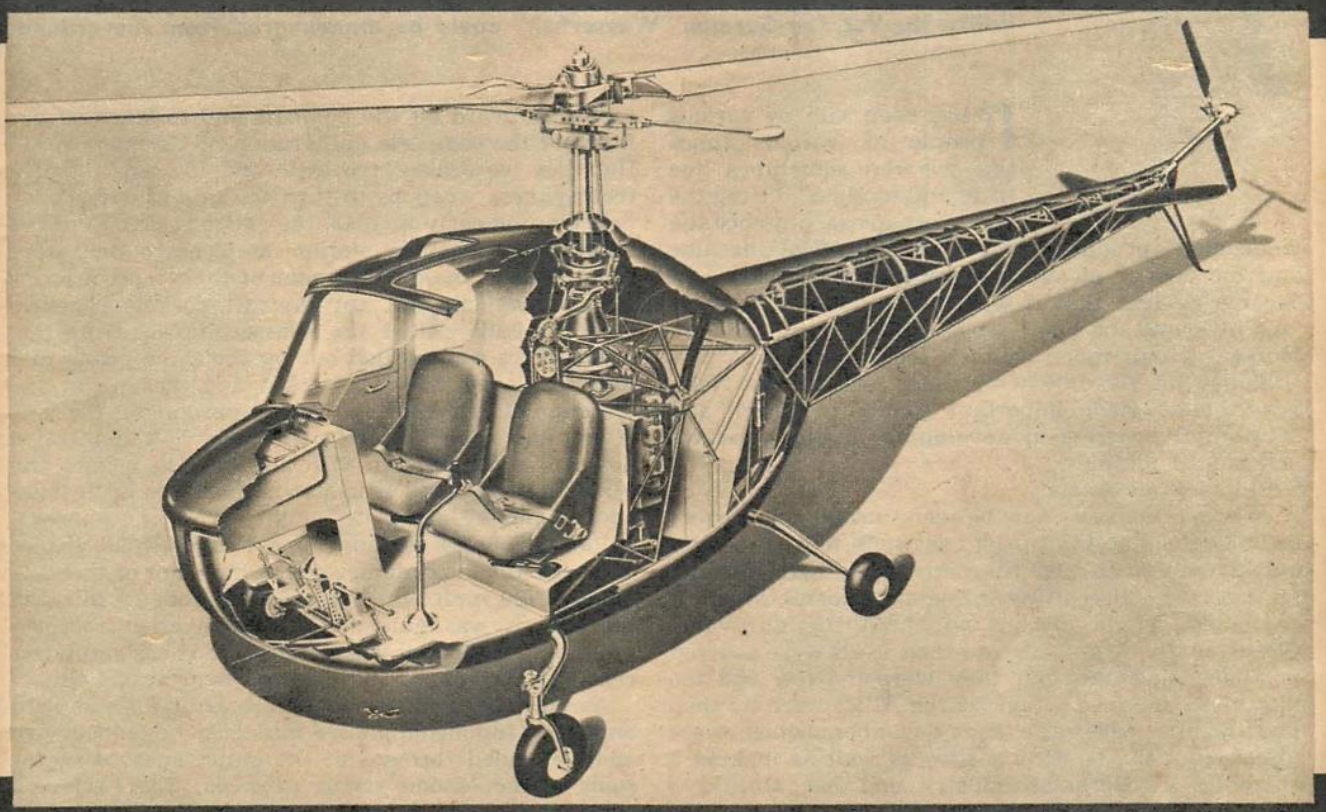
● Clean, good looking Firestone helicopter introduced in 1946.

● Helicopter Eng'r'g Research Co.'s JOV-3. Tandem rotor setup.



● Sikorsky VS-300: This was second prototype ancestor of a long line of successful machines.

● Roteron XM-1: Single-place coaxial helicopter powered by 5-cyl. 25-hp motor. Wt., 400 lbs.



● **What a helicopter's "insides" look like. Cutaway of the Bell Model 47. Note up-ended engine located behind seats.**

● Kaman K-190: Three-place utility has intermeshing rotor blades.

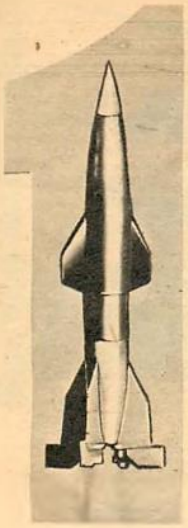
● Helicopters Inc. 4-place Model J originally designed by Bendix.

● Jet-propelled Helicospeeder designed by Antoine Gazda. Jet at rear is anti-torque device.

● Cutaway view of 7-passenger Doman Pelican shows engine located in nose. To carry 1,400 lbs.

● The Brantly helicopter, a two-place coaxial machine. It is still in the experimental stage.

● One of the best looking 'copters was Landgraf H-2. Has lateral overlapping rotor blades.



st Supersonic Guided Missile

By R. G. NAUGLE

Unlike the V-2, the German "Wasserfall" could be maneuvered from the ground.

IT has been said by various people at various times that we were sometimes "too little and too late" during the war. Perhaps so, but once the tremendous productivity of our industrial machine and the energy of our manpower was unleashed, it became evident that it was the Germans who were "too little and too late"—and certainly so in the perfection of their much vaunted secret weapons.

Somewhat too late with their rockets, the Nazis nevertheless made important strides in design and substantial progress in developing practical rockets and guided missiles.

But they *were* late!

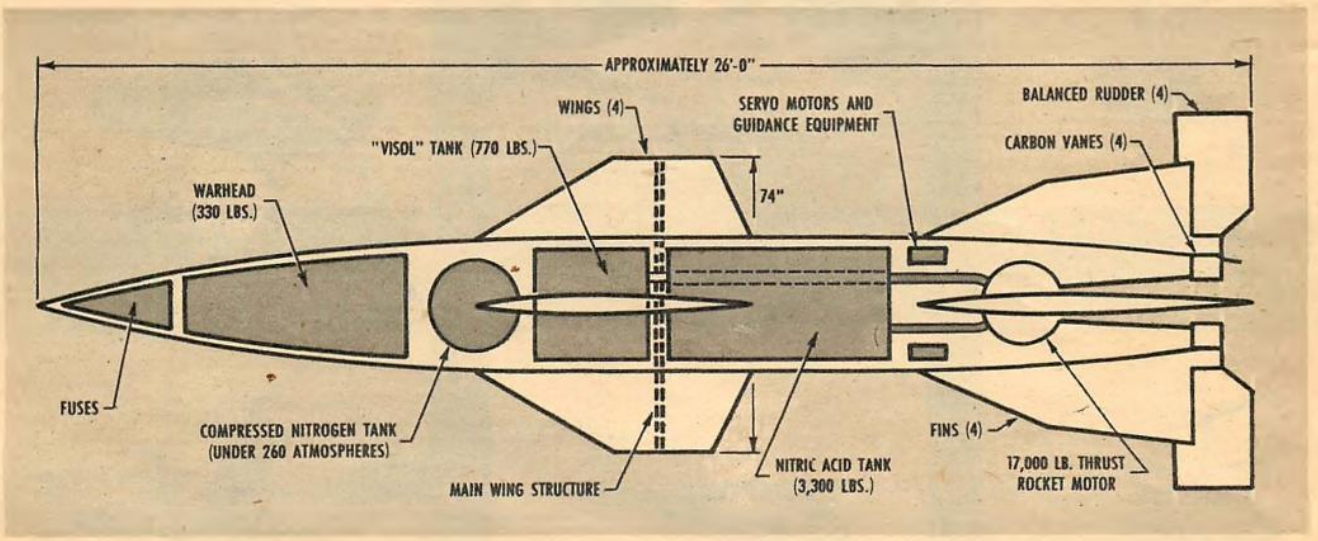
At any rate, it can now be seen that they first overestimated the ability of the Luftwaffe to end the war quickly so that in 1942 Germany found herself losing far too many aircraft over England—losses which, if continued, would all but wipe out the Luftwaffe. Consequently, first V-1's and then V-2's were ordered in huge quantities—but they were too few and too late in getting into action, as the Allies were by then flooding the skies with heavy bombers which were pulverizing the launching sites as well as making a shambles of German industry and her ability to wage war.

Instead of offensive weapons like the V-1 and V-2, Germany needed defensive weapons desperately—anti-aircraft rockets and rocket-propelled interceptors to ward off the bombers and to stave off defeat and the complete obliteration of Germany itself. But they were also "too little and too late" in perfecting these weapons to turn the tide of defeat.

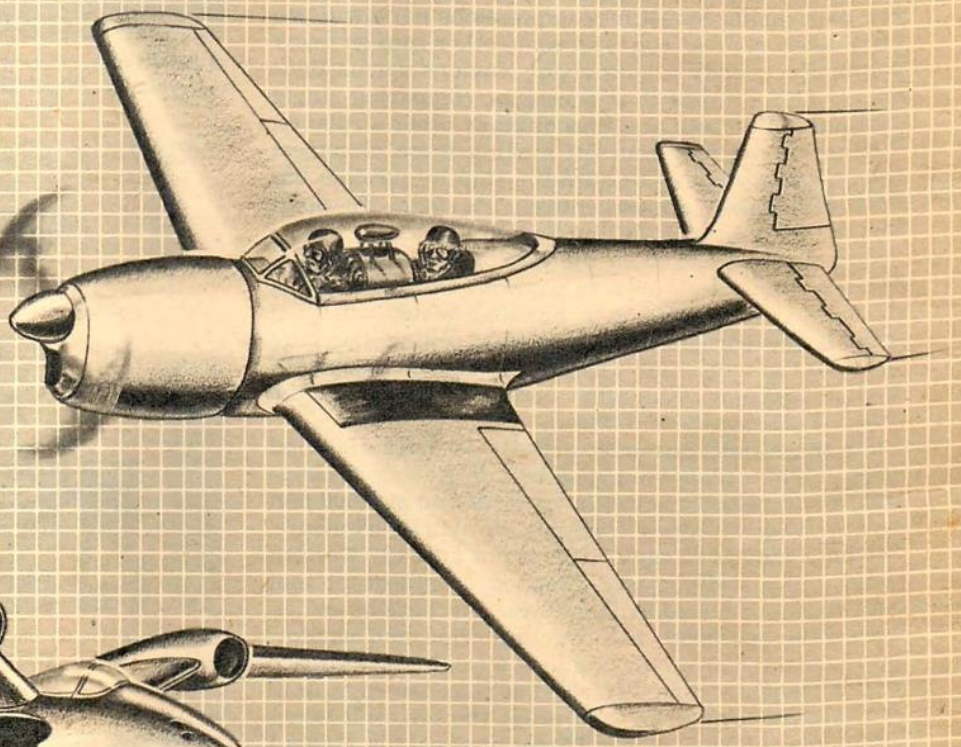
Beginning early in 1943, the entire resources of the rocket experimental station at Peenemunde were committed to the development of their most promising ground-launched, anti-aircraft, rocket-propelled, guided-missile called the Wasserfall—or Waterfall. The project was carried out by the same group that had developed the V-2 rocket and was under the direction of Professor von Braun, designer of the V-2. It was developed directly from the V-2 but scaled down to a diameter of 880 mm, or 34½ inches, and a length of 26 feet. It had four short fins or "wings" added midway along its length. Weighing approximately 7,700 lbs. at launching, it carried 330 lbs. of warhead at a maximum speed at the point of fuel cut-off of 1,700 mph which carried it some 11 miles in the air. It was guided and maneuvered from the ground by radio and was designed to chase and intercept allied bombers and destroy them in mid-air.

As such, it was the first successful fin-stabilized and wing-supported guided missile to be maneuvered and controlled throughout the entire subsonic, transonic and supersonic ranges of speed. The 1,700 mph corresponds to a Mach number of 2.5, so for the first time the formidable transonic barrier was effectively breached without any loss of stability or control.

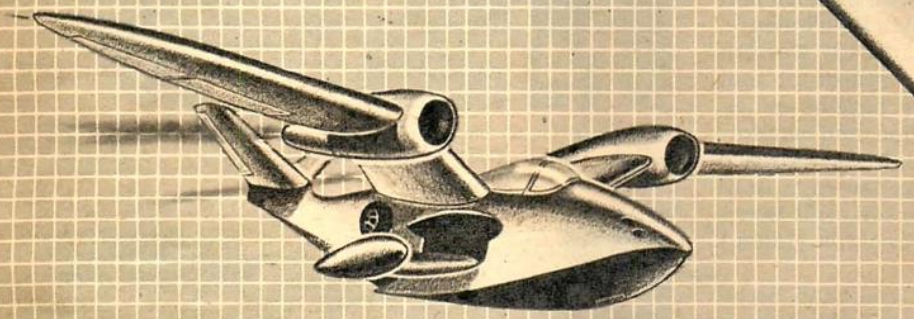
The V-2, of course, was (*Continued on page* 76)



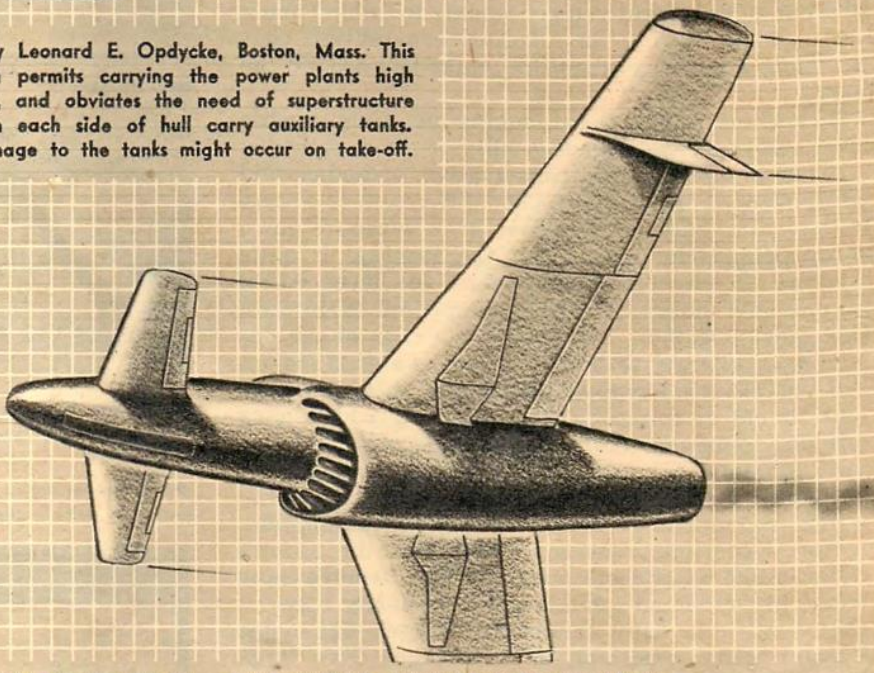
Airmen of Vision
DESIGN COMPETITION



● First Prize: by James W. Kiel of Lancaster, Pa. A two-place training plane. A very clean, conventional low-wing aircraft with retractable landing gear and flaps. Suitable for military use both as primary and basic trainer. Performance similar to No. Am. T-6, but with better climb. Both Beechcraft and Temco have offered similar trainers to the military with idea that type is economical to operate.



● Second prize: a twin-jet amphibian by Leonard E. Opdycke, Boston, Mass. This interesting design has a gull-wing which permits carrying the power plants high above hull and well out of water spray, and obviates the need of superstructure for raising the wings. His hydrofoils on each side of hull carry auxiliary tanks. The wisdom of this is doubtful, since damage to the tanks might occur on take-off.



● Third prize: a canard-type jet-powered fighter bomber by Joseph M. Cartelli of Corona, N. Y. —15 years old and a technical student at Newtown High School. This is a very interesting design with good possibilities, though the air scoop could be reduced in size without impairing thrust. This would decrease drag considerably.

Air Trails has opened its columns to those who are interested in presenting plans for aircraft of the future.

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AIR TRAILS

OCTOBER 1950

25 CENTS

DUO-MONOPLANES

Read the dramatic story of France's most daring designer

AIR TRAILS

OCT., 1950 • VOL. XXXV, No. 1

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IN THIS ISSUE:

Cover: Duo-Monoplane S. Calhoun Smith 1
Showcase 10
Airmen of Vision 14
Air Notes 16
Commies in Profile 19
Delanne: Duo-Monoplanes Wm. S. Friedman 22
Job in Aviation: Flight Engineer ... 24
Hawker Super-Fury 25
Air Progress: Hawker Co. Doug Rolfe 26
Yumpin' Yupiter ..... Ed. Francis 28
Development Highlights 30
Solo Club 32
C.A.P. Newsletter 33
Duo-Mono Model ..... S. C. Smith 34
Squeeze Play ..... Walt Hughes 37
Strato-Flash ..... M. S. Andrews 38
19th Model Nationals H. A. Thomas 40
Buhl Bull Pup ..... Charles Hollinger 42
Leading Lifters ..... Frank Zaic 44
Dope Can ..... "Dopester" 48
The Peppy Trainer 50
Model of the Month: Tuffy 54
Motor of the Month: Wasp .049 ... 56
Sketchbook 58

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THE READERS WRITE:

G.I. Problems . . . We here in Austria are having a number of problems. First, we are unable to get glow fuel. Second, we are unable to get dope. We have been trying to obtain materials with which to mix our own fuel, but couldn't. We were wondering how it was possible for the G.I.s in Germany to obtain said fuel and dope while we cannot do so.

We are ardent glow-plug fans and cannot understand why the hobby companies in the States can send glue and No. 70 oil overseas, yet they are unable to send fuels. We will welcome all suggestions sent us. Among others, I am speaking for Pfcs. John W. Austin and Robert B. Carpenter as well as myself.

Pfc. James M. Cobrando, RAO Opn. Co., 63rd Sig. Opn. Bn., APO 541 U. S. Army, c/o PM, New York, N. Y.

Can't Take Credit . . . In reference to your recent article entitled "The Home-Bilts Are Back," I wish to inform you and especially the readers around Plainview and Crosbyton that my name was linked to the construction of a small low-winged lightplane (made of Cub parts) quite by error. Perhaps you were misinformed by the American Airmen's Association to whom I furnished the picture you printed.

I am not acquainted with the builder, nor do I even know his name, but I am sure it was based at Crosbyton, Tex. I merely happened to be at Plainview when I saw it. I snapped the picture and jotted down performance figures which were given me by a mechanic friend who worked there. . . . So the statement that I built the plane is not correct. I'm sure a lot of people in Texas would wonder what I was up to by such a claim.

Ernest A. Bode, Canadian, Tex.

First Airmail by Modelplane . . . I think your magazine has done a wonderful thing in making available to youngsters your full-size plans at a nominal cost. The one thing that is a waste of space for a majority of them, as far as building goes, is the plans presented in a magazine and then captioned "half size" or whatever it may be.

In regard to the first model airmail flight, I am inclosing a clipping and wish to make a few remarks. . . .

C. W. Millice, Hamilton, Ohio

• Friend Millice, a watchmaker and jeweler long interested in planes, takes issue with statements (made other than in AT) that the PAA-Load event at the 1949 Nationals at Olathe was the first time airmail was carried by modelplanes. The clipping he sends is from the Dayton Daily News which appeared in late September 1939. It shows a fellow launching a gas model with NAA gas model license numerals on the wing, and reproduces an envelope addressed to "Mr. Jack Hohne, Dayton Daily News, Dayton, Ohio." The letter is postmarked at Gettysburg, Ohio, September 25 at 10:30 a.m. and bears the notice, "First letters carried by gas model airplane, Sept. 24, 1939, 1:30 p.m., Lansdowne Airport, Greenville, O."

The clipping reads, "Ralph Snyder, a member of the NEWHIO Junior Flying club is shown above as he launched his Mercury gas model on what is believed to be first air mail flight by model plane.

"The model containing 20 air mail letters, took off from Lansdowne airport, Greenville, last Saturday afternoon. After flying out of sight, the model was found on a farm near Gettysburg, O., from which point the letters continued on their way. . . . Snyder is one of the most active model plane builders in Darke county and was one of the organizers of the Lansdowne Aeronauts club. In addition to placing among the winners at several contests this year, he has also done considerable experimenting in the model field."

Snyder, who manufactured Snyder S props in Colorado Springs and who is back in Greenville for awhile reports that on his mail flight the model was equipped with a larger gas tank and reached an altitude of about 3,000 ft. With a companion he followed the mail-model in a Porterfield and saw the Mercury land about 6 miles from its take-off point. The ship was retrieved and the letters mailed at the nearest post office, which was Gettysburg.

Okay, Ohio, until we receive other proof we'll credit you with the first model airmail flight. Any other contenders?

Word from Hong Kong . . . May I take this opportunity to commend you upon the excellence of your magazine of which I have been a subscriber for the last five years. Your magazine is always interesting reading and an excellent source of information for both air-minded and modeling enthusiasts.

K. C. Wong, c/o China Egg Produce Co., Hong Kong

Air Trails Clubster

The Lightplane Picture . . . The engineers at Cessna must have taken to heart your suggestions about the ideal lightplane as proposed in your design called the "Clubster." The Cessna 305 certainly looks pretty much like what the man ordered. High visibility cabin, steel strut landing gear, single wing strut, simple development tail cone and the like. Sorry about the tail surfaces, though, they're using 170 tooling on this one. Wouldn't that make a pretty AA job?

Earl Merrifield, Portland, Ore.

Cessna 305

First Jet to Fly? . . . There are still arguments who first invented the idea of the jet-propelled plane. I have a report that the first propelled flight was made in August 1940, but it does not mention by whom.

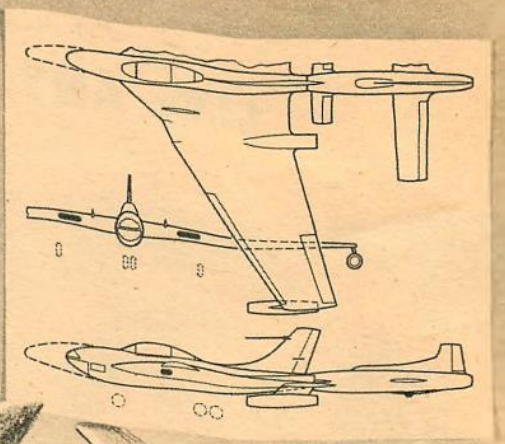
In 1944 or thereabouts the Associated Press news from London announced in our daily papers that an Italian had invented a jet plane. This is the first time any news had been published that such a plane had been invented. So if this report is not correct, it still remains an open question who was the inventor of the jet plane.

Hildore C. Ecklund, Great Falls, Mont.

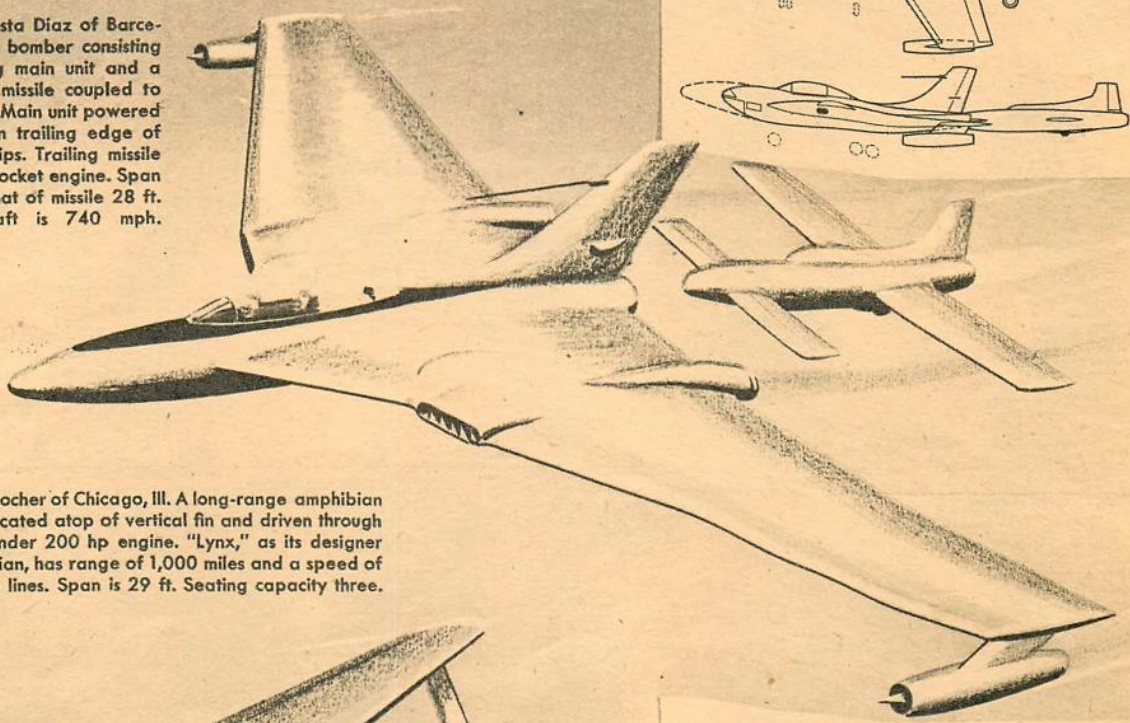
• The first airplane powered by a turbo-jet engine to fly was a German Heinkel He-178, equipped with a Heinkel S3B jet engine. The date was August 27, 1939. Exactly one year later the Italian plane Caproni-Campini was flight-tested for 10 minutes, and on November 30, 1941, the Italian pilot Col. Mario de Bernardi with a passenger made the first cross-country flight in a jet plane from Milan to Rome with a stop at Pisa, a total distance of 300 miles at an average speed of 160 mph.

(Continued on page 9)

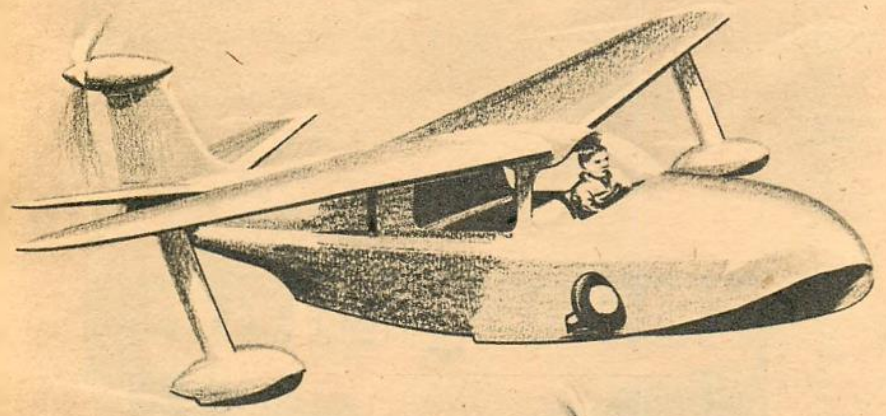
Airmen of Vision
DESIGN COMPETITION

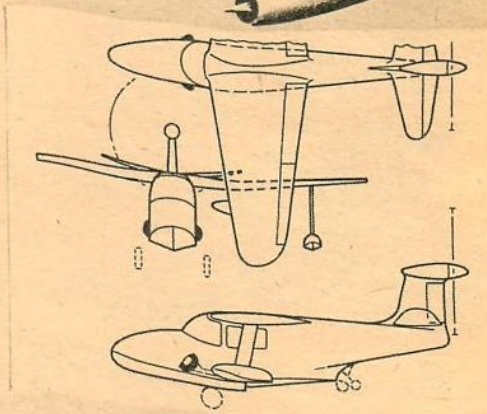


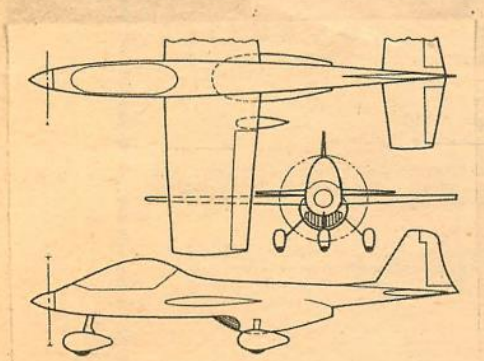
First prize: by Pablo Ayesta Diaz of Barcelona, Spain. A composite bomber consisting of a manned flying wing main unit and a canard radio-controlled missile coupled to rear of the mother-plane. Main unit powered by 2 turbo-jet engines in trailing edge of wing and 2 ram-jets at tips. Trailing missile derives its power from a rocket engine. Span of flying wing is 85 ft., that of missile 28 ft. Top speed of this craft is 740 mph.

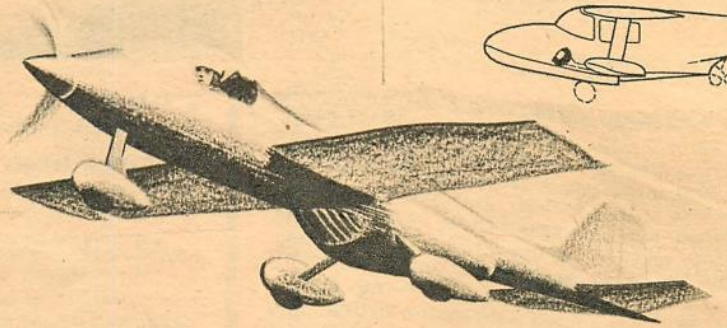


Second prize: by Richard Locher of Chicago, Ill. A long-range amphibian with a pusher propeller located atop of vertical fin and driven through geared shaft by a 6-cylinder 200 hp engine. "Lynx," as its designer calls the all-metal amphibian, has range of 1,000 miles and a speed of 170 mph, thanks to clean lines. Span is 29 ft. Seating capacity three.









Third prize: a single-place racing plane of the 190 cu. in. midget formula by Ernest Barter, Oakland, Calif. Novel design features mid-fuselage location of engine which drives propeller through shaft and chains running in oil bath. In this case the ailerons act also as flaps. The plane has speed of 180 mph.

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three-views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and judges. The designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should keep copies of all material submitted. Mail entries to Airmen of Vision, c/o Air Trails, Box 489, Elizabeth, N. J. The editors regret that because of large number of entries they cannot enter into correspondence on Airmen of Vision.

AIR TRAILS
OCT., 1950

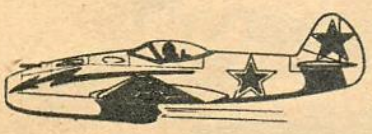
Commies in Profile

Some months back Air Trails presented evidence that the Reds weren't stallin' when it came to aeronautical advancements. Here's an up-dated report on the latest Russian warplanes that comes from behind the Communist curtain. It proves that the Reds will be hard to beat in the air.

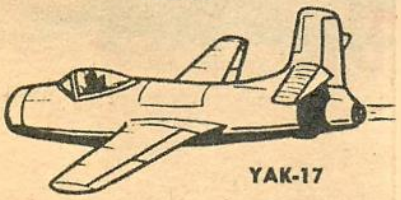
COMMIES IN PROFILE

FIGHTERS

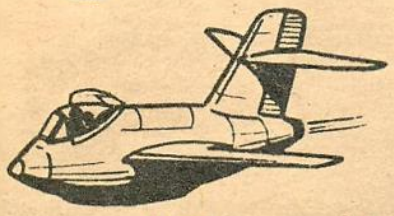
YAK-9



YAK-15



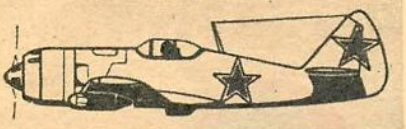
YAK-17



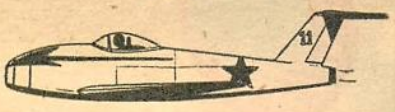
YAK-21

MIG

MIG-9

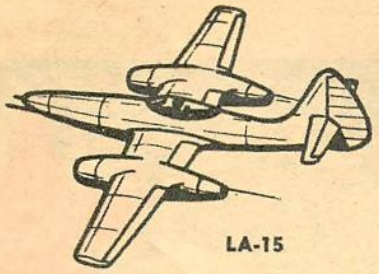


LA-9



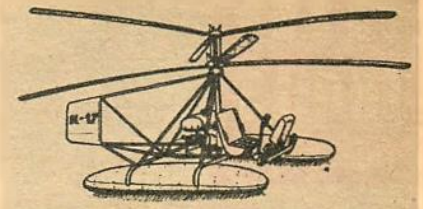
LA Fighter

LA Research

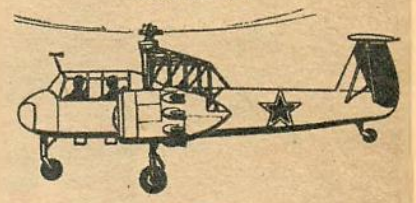


LA-15

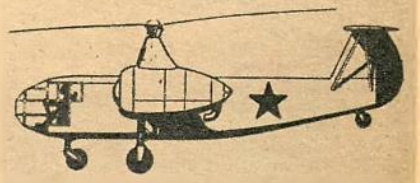
HELICOPTERS



VERTOLYOT



OMEGA



OMEGA II

■ To underestimate the strength, brains and ability of a potential enemy is one of the most serious mistakes a nation can make. Although a country may seem backward to us by our own standards of everyday living, it does not follow that its military might and know-how are on the same, less favorable level. The most striking example of this paradox today is Communist Russia, and perhaps the most arresting phase of that example is its air force.

Always having produced good firearms, artillery and tanks, the USSR is turning out a first-class air arm which in quality approaches ours and in quantity probably far exceeds it. Shrewd and unhampered by economic aspects of government purchases, Russia solved its engineering and technical handicaps by acquiring some of the best scientific brains of Germany; moved a number of German plants into its interior, and has in its possession many of the latest Nazi research and experimental aircraft, jet engines and guided missiles. Add to all this the fact that Soviet industry has remained on a war footing, and it is not hard to conclude that the Communists would make a formidable adversary in the air.

The Soviet planes shown on these pages confirm the strength of the Russian Air Force. That the information on them is available also points to the likelihood the Commies have bigger and better aircraft up their commodious red sleeve.

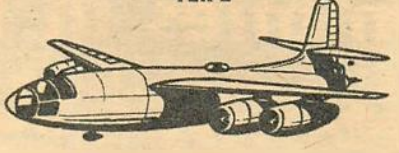
It might be pointed out that Russian airplanes are designated by the first two letters of their designers' names and not by type as in the United States. Thus the prefix YAK means the craft was designed by Alexander Yakovlev; LA, by Semyon Lavochkin. If more than one person was responsible for the design, the designation combines the initials of all, as in the case of the MIG, the designers of which were Mikhoyan and Gurevitch.

Engine designers are also honored by having their names affixed to the name plates of engines, except that the initials of the first name are added to those of the given name. Thus, the ASH radial air-cooled engines are named after A. Shvetsov; the 12-cylinder V-type liquid-cooled powerplants AM and VK after A. Mikulin and V. Klimov. However, the Russians in some cases stick to the all-over designation of "M," (for motor) as exemplified by the engine designation of the small MIG Utka liaison plane and the large four-engined transport TU-70.

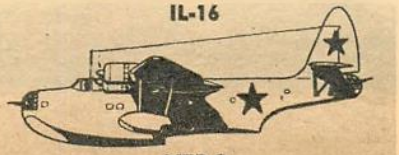
BOMBERS

TU-70B

YER-2

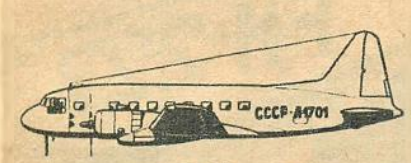


IL-16

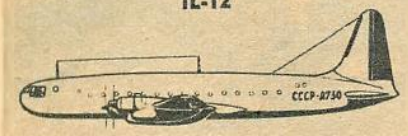


MTB-2

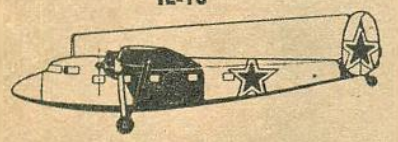
TRANSPORTS



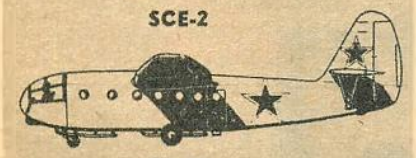
IL-12



IL-18



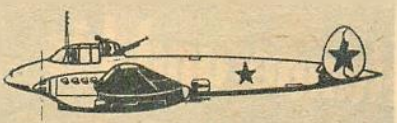
SCE-2



KC-20

SPECIAL ATTACK CRAFT

IL-10



PE-3

Fighters

YAK-9. This is a World War II single-place fighter of which there are three variants, 9D, 9U and 9T. The D is a conventional high-altitude aircraft while the T and U were modified to act as tank destroyers and low-altitude strafers. The D was armed with a 20-mm cannon firing through the propeller hub and two synchronized 50-cal. machine guns in the engine cowl. In the other two models the 20-mm cannon was replaced by a 37-mm. The structure of the three models is the same, consisting of a steel tube fuselage covered by plywood shell. The wing has an extruded aluminum spar, wooden ribs and plywood skin. Control surfaces are fabric covered. The YAK-9 is also used by the Polish and North Korean air forces.

Wingspan 32 ft. 10 in. Length 27 ft. 10 in. Gross wt. 7,100 lbs. Powered by a V-12 liquid-cooled engine rated at 1,260 hp. Maximum speed 370 mph. Range 900 miles.

YAK-15. The first Russian service jet fighter, this is now relegated to secondary duty of training jet pilots. Early news reports had this airplane appearing on the Korean front. In any case, it is likely the Russians do not find its performance adequate for their own service squadrons. It is claimed that the YAK-15 made its debut in small numbers when the Soviet Forces entered Berlin in 1945. Contrary to general practice, YAK-15 has two-wheel landing gear.

Wingspan 32 ft. 10 in. Engine Junkers Jumo type developing close to 4,000 lbs. of thrust. Maximum speed, approximately 500 mph.

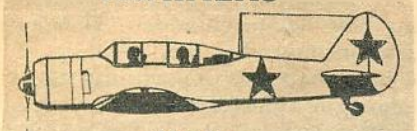
YAK-17. A new fighter, information on which is not available. Generally resembles our Republic F-84. Tail-surface shape departs from usual Soviet practice, especially as to the rudder, which in most cases has a well-rounded trailing edge.

YAK-21. To call this airplane YAK is a typical Russian stunt, for it is nothing more than a redesigned Messerschmitt 163 or its later version known as Junkers 248, the famous German rocket fighter. The designer Yakovlev did add a horizontal tail to the original version. The YAK 21's are known to be in mass production and fitted with adequate artillery to take care of any high-flying enemy bombers which may invade Soviet territory. Duration 15 minutes.

MIG—. This is a design by the combined forces of Mikhoyan and Gurevitch who produced a number of successful fighters during the war. This particular model is based on one of their latest efforts in piston-engined single-seaters to which has been added a liquid-propellant rocket located in the rear section of the fuselage. Whether this design was an experimental one to test rocket propulsion or whether it is a standard service aircraft equipped with rocket boost for extra thrust is a matter of speculation. By all outward appearance the plane is similar to the MIG-5. The piston engine is a 14-cylinder, air-cooled radial ASH-82 rated at 1675 hp.

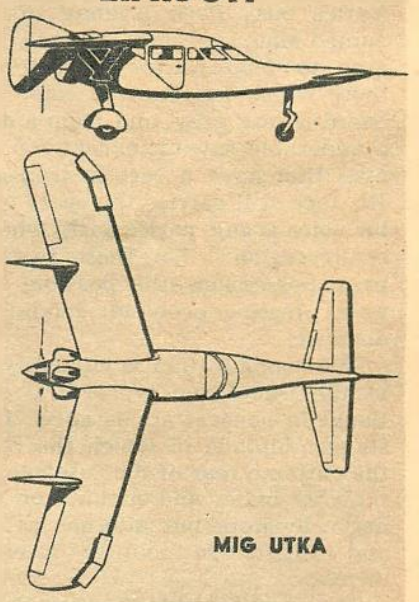
MIG-9. This is a twin-jet heavy fighter with both engines located on the underside of the fuselage, which has a single divided air intake in the nose. The two powerplants are variously reported to be either the German BMW 03 of 3,300 lbs. thrust each, or the Russian Chelomeyov, a modified version of the BMW design, but of greater (*Continued on page* 73)

TRAINERS

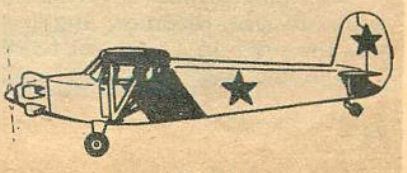


YAK-20

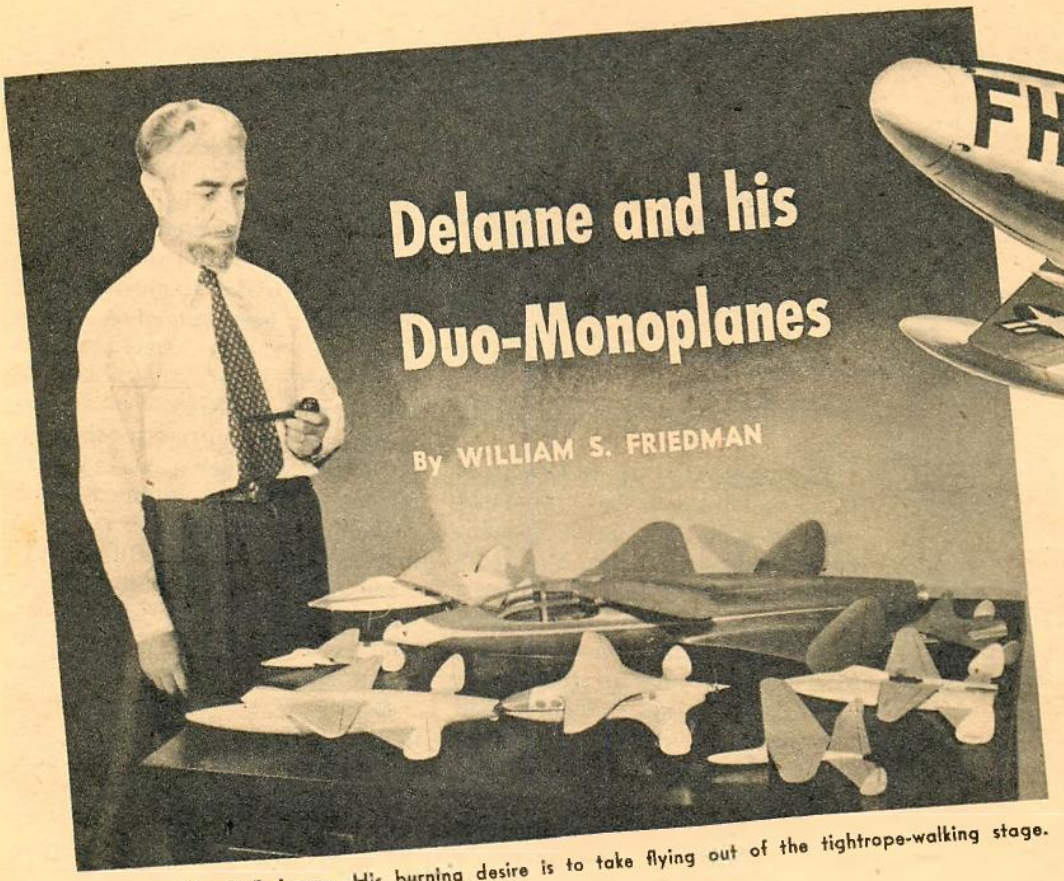
LIAISON



MIG UTKA



YAK-14



Maurice Henri Delanne. His burning desire is to take flying out of the tightrope-walking stage.

Delanne and his Duo-Monoplanes

By WILLIAM S. FRIEDMAN

How a brilliant French designer kept from the Nazis the secret of his sensational plane that may solve one of our most critical air problems today

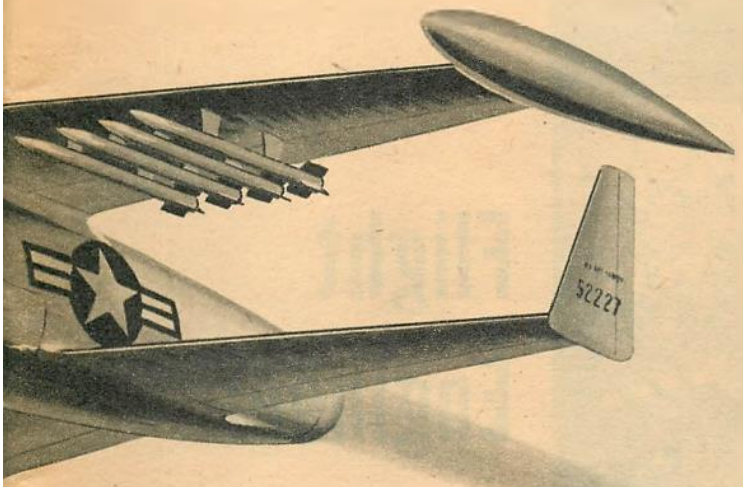
■ In a quiet, cell-like room, below the level of New York's busy Park Avenue sits a studious engineer named Maurice Henri Delanne. His hair streaks from grey to dead white—characteristic irregularity for those whose hair turned color in a hurry. His neat beard is iron grey, and from a distance, he looks like a venerable savant, except for a pair of lively blue eyes that have a certain teen-age sparkle to them. His face still carries the scars of great suffering, but his voice is gay, particularly when he talks about "my configuration." For these two words represent his prize possession—the possible solution to aviation's most pressing problem: landing speed and take-off distance.

The configuration is currently being merchandised as the Duo-Mono type. It is somewhat unconventional in general appearance. It resembles a highly stagger biplane in which the rear airfoil, located at the extreme rear of the fuselage, is somewhat smaller than its mate, and mounts on its trailing edge not only elevators but ailerons as well. End-plate fins and rudders are mounted on either side of the rear member.

The exact formula covering the relation between the wings in size, distance, angle of attack and the like was the prize in a neat yet terrible battle of wits and patience between Maurice Delanne and the agents of the Luftwaffe. Had the Nazis won, they might have had in their possession a system for giving their bombers and fighters faster take-off, greater range and cruising speed as well as better payloads and maneuverability. The end effect cannot be calculated at this point. However, the mathematical proof of the efficiency of this formula is so fantastic that it has taken since 1946 to convince some of our leading manufacturers that it was even possible.

Now, through a slow and scientific presentation of the facts, a number of leading plane builders are re-examining the Duo-Mono system. This time, they must. With the demand for higher cruising speeds for fighters and bombers, landing speeds and take-off distances are becoming impossible. The high-lift devices currently known are definitely limited, and jet-assisted take-off is not only expensive but has strict limitations for formation and rapid-sequence take-off. Something new has to be added. Delanne's Duo-Mono configuration may very well be it.

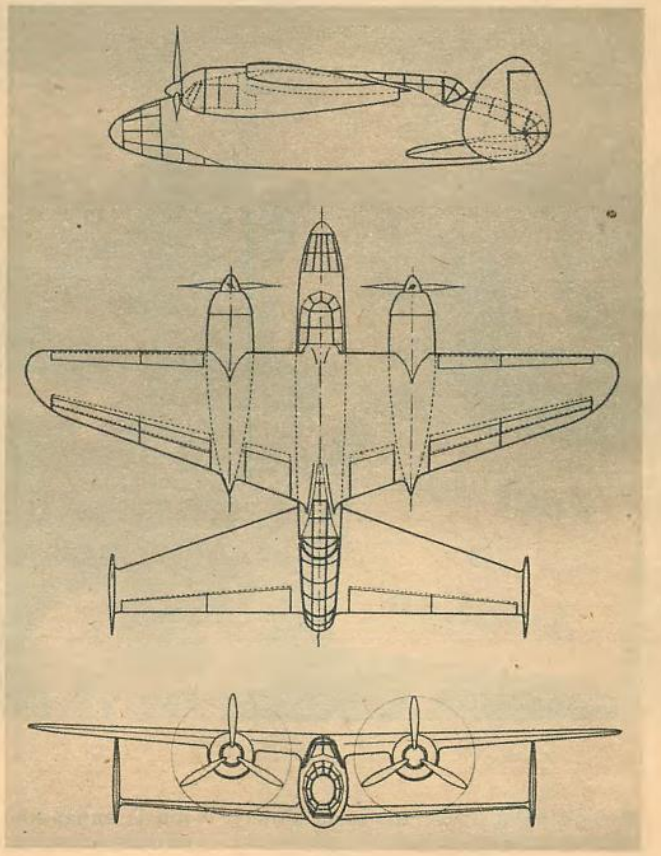
Those men who have had the opportunity to examine the Duo-Mono type's performance have great faith in its possibilities; but success or failure, it is the center of one of the most dramatic stories of our times, the story of a stubborn and courageous man



Delanne jet fighter as visualized by our artist. Top speed should be 700 mph.

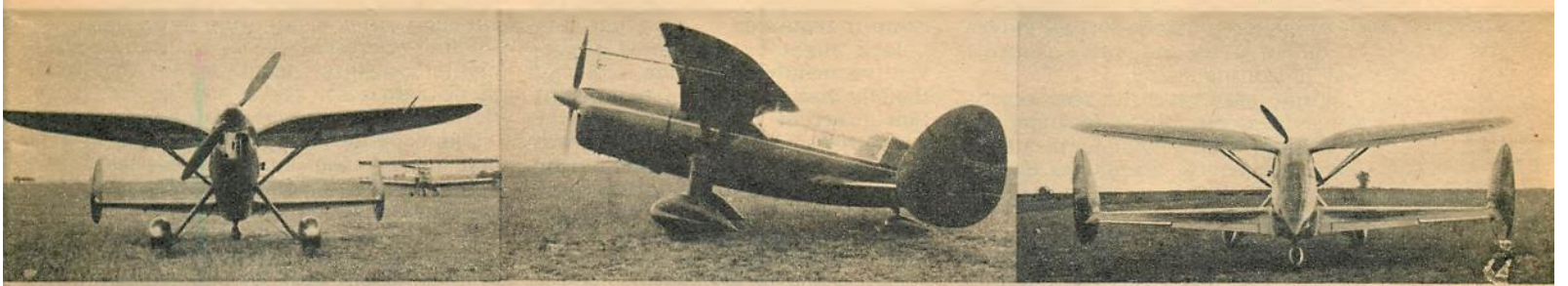
who knew that he had something to offer mankind, and was bent on seeing it used for good purposes only.

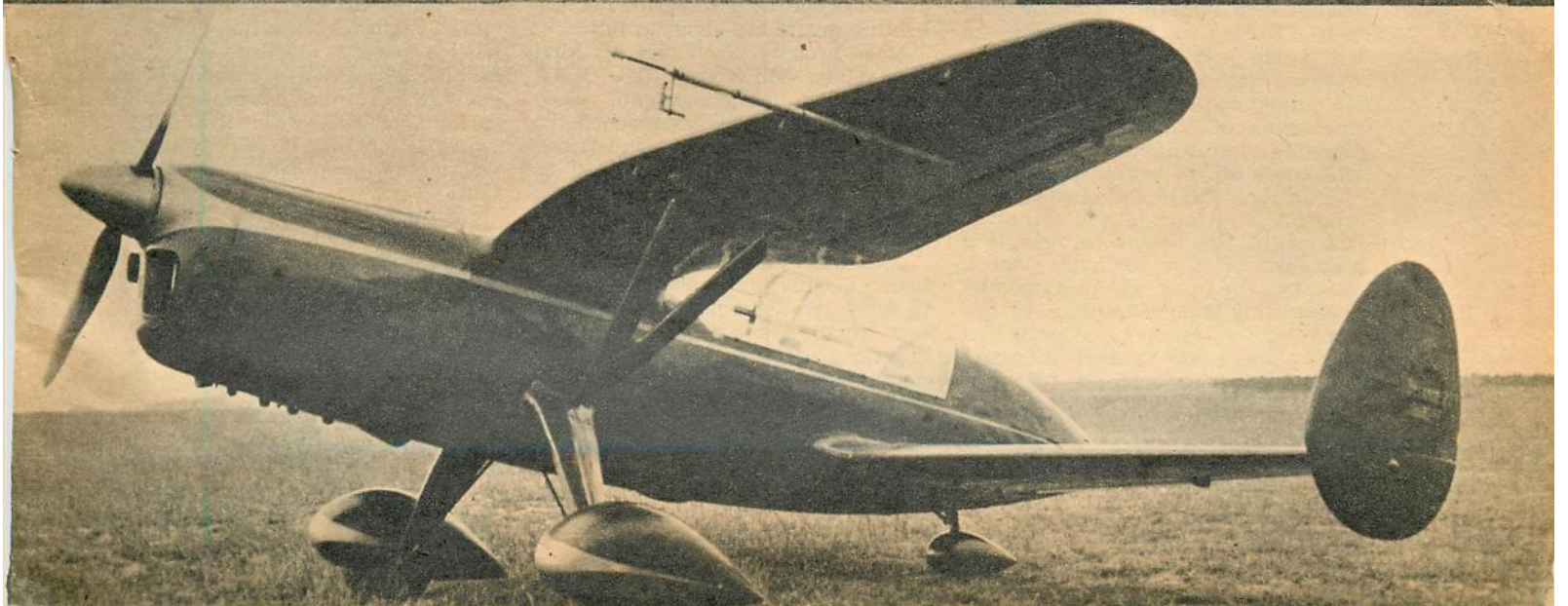
Maurice Henri Delanne was born in the town of Diors in France early in 1901. He grew up in the golden age of French aviation, the age of Farman and Bleriot; of Fonck, Guynemer and Nunguesser. He received his degree at the famed Superior School of Aeronautical Engineering in Paris, in 1924. Having some funds of his own, he founded his own company, the "Société Anonyme de Recherches Aeronautique." In this era the biplane was still supreme. Surplus equipment from World War I was still available, so Delanne decided that what (*Continued on page* 60)



Twin-engine bomber was in the design study stage as a special project for the French Air Force when the Nazis struck.

Model 20T-02. First Delanne Duo-Monoplane to fly. Had remarkable performance considering that it was powered by only 180 hp. Rate of descent in stall comparable to that of a parachute. Rudders, in this instance, act as tip plates, increasing efficiency.





AIR TRAILS

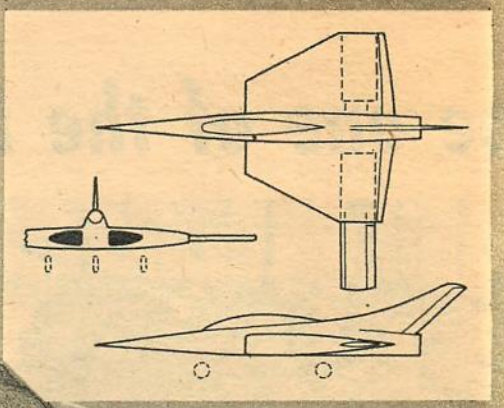
NOVEMBER 1950

25 CENTS

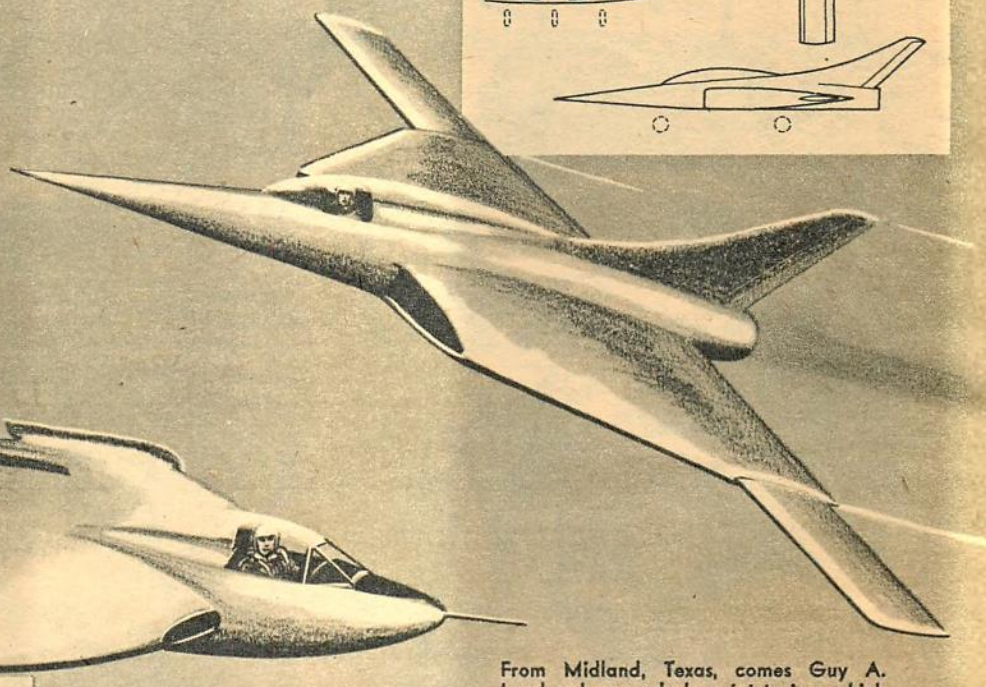
Exclusive Inside Story:

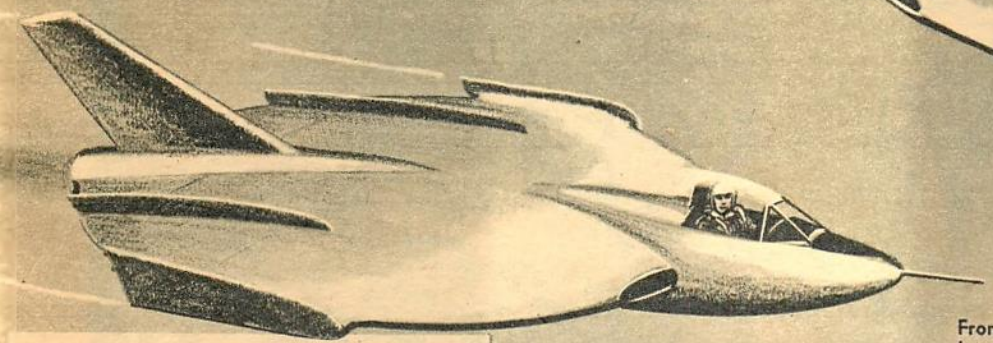
I Designed the Jap Zero BY JIRO HORIKOSHI

Airmen of Vision
DESIGN COMPETITION

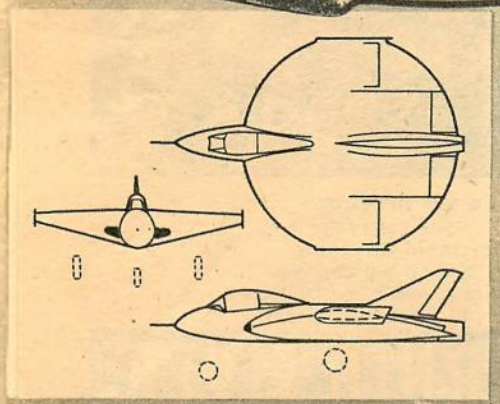


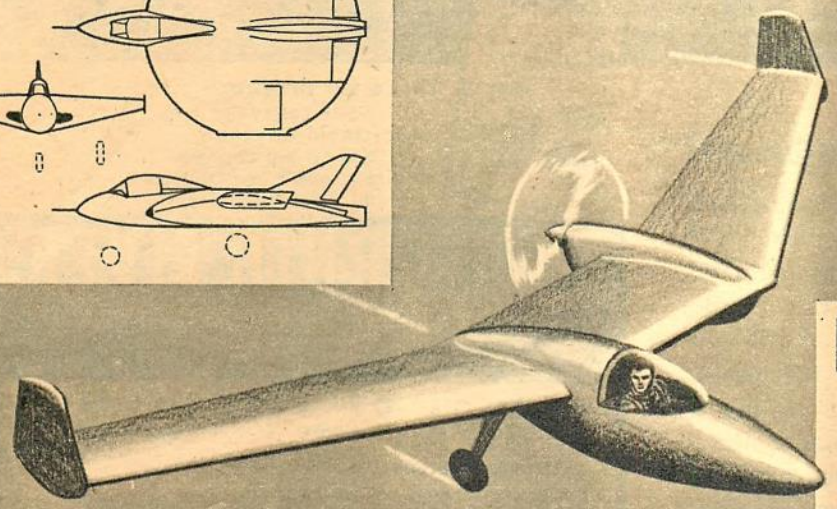
First prize (right) is a single-jet single-seat delta-wing fighter by C. R. Tennant of Leicester, England, a draftsman for Auster Aircraft. Retractable outer wings improve controllability at low speeds giving 10:1 speed range, 75 to 750 mph enabling craft to operate from carriers. Span (super-sonic), 28 ft.; sub-sonic, 49 ft. Length, 46 ft. Wing area (super-sonic), 325 sq. ft.; sub-sonic, 395 sq. ft. Gross weight of plane, 20,000 pounds.

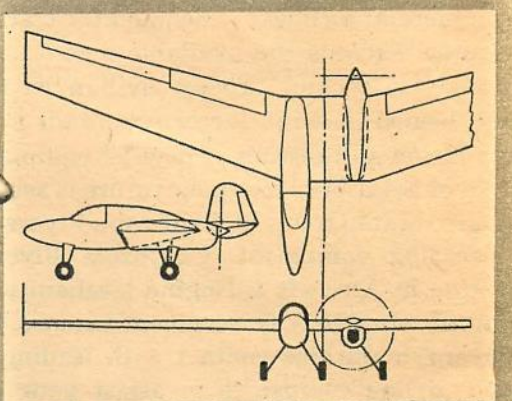




From Midland, Texas, comes Guy A. Landrum's second-place jet trainer which features a Westinghouse J-30 engine mounted on pivoting supports so jet can be swung up and out for easy maintenance. Span is 12 ft., length, 17 ft., 2 in. Maximum speed is 450 mph, stall, 75 mph. Range is 600 miles. Advantages cited for circular-wing planform are strong construction, possible delay of high speed stalls and low vertical sinking speed with minimum forward speed.



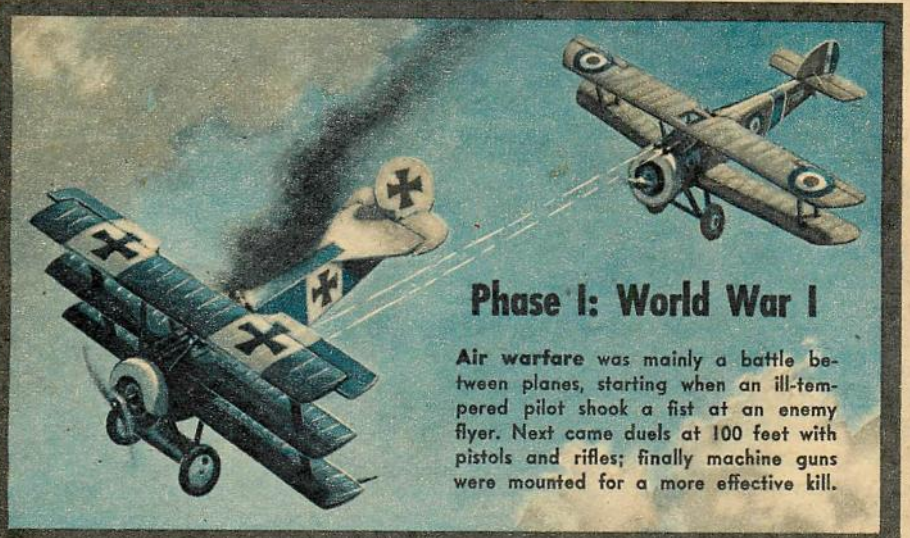




Third place this month goes to Robert Woods, Trenton, N. J., with his "Privateer" design, an asymmetrical flying wing pusher for sport and personal use. Span is 28 ft.; top speed, 195 mph. Power is to be supplied by a 90 hp, 6-cylinder in-line engine. This single-place job should weigh about 600 pounds. Says Woods, "Although at first glance the off-center motor mount would seem to cause a serious yaw, it's not likely: thrust line is less than 2 ft. from C. L. and C. G."

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three-views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and judges. The designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should keep copies of all material submitted. Mail entries to Airmen of Vision, c/o Air Trails, Box 489, Elizabeth, N. J. The editors regret that because of large number of entries they cannot enter into correspondence on Airmen of Vision.

Air Warfare—Phase III

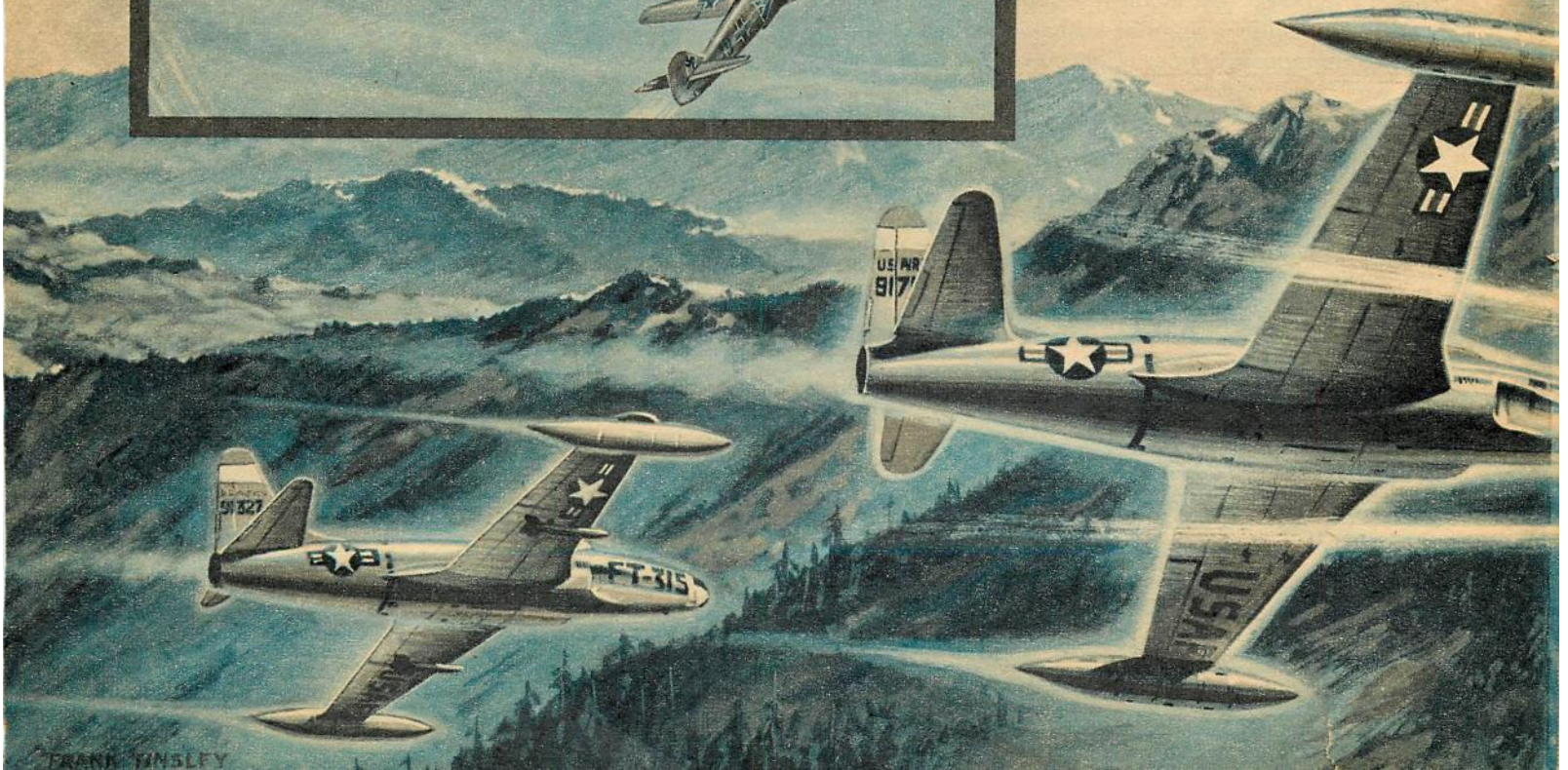


Phase I: World War I

Air warfare was mainly a battle between planes, starting when an ill-tempered pilot shook a fist at an enemy flyer. Next came duels at 100 feet with pistols and rifles; finally machine guns were mounted for a more effective kill.

Phase II: World War II

In early part the fighter still acted as plane destroyer, but greater number of heavy caliber guns and ability to carry a large bomb-load increased its versatility, turning the fighter into an effective weapon against ground targets.



FRANK HINSLEY

The third phase came into being on the Korean front. Here the fighter plane really demonstrated its many-sidedness. The Lockheed F-80s, as yet untried in battle and designed primarily for high-altitude fighting, proved effective tank destroyers, using rockets against enemy armored columns, while not only liaison planes but even T-6 trainers were pressed into service to spot Red tanks. Propeller-driven American aircraft were in immediate demand.

AIR TRAILS

Pictorial

MAY 1949

25 CENTS

See ATOM POWERED BOMBERS!

AIR TRAILS Pictorial

MAY, 1949 • VOL. XXXII, NO. 2

The two sailplanes illustrated on this month's cover are soaring on the "standing wave," a condition discovered fairly recently in mountainous terrain. By utilizing it, motorless craft can reach extremely high altitude. Standing wave is recognizable by peculiarly shaped clouds suspended in the lee of mountain ranges.

THE READERS WRITE:

CAP Assist

Sirs:

We are in receipt of numerous letters, forwarded by your office, from air enthusiasts interested in becoming members of the California Wing of Civil Air Patrol, and we wish to extend our sincere thanks for your thoughtfulness and courtesy in forwarding these letters to our office.

The work of Civil Air Patrol in creating and maintaining a keen interest in aviation among civilian populations, and providing a pool of trained aviation personnel is recognized as vital, and your splendid magazine is helping along the invaluable endeavor of creating in young America the desire to fly, and aiding in the task of providing the huge reservoir of pilots and trained personnel which will keep America to the fore in the world of aviation.

D. E. CARSON
1st Lt., CAP, Wing Adjutant
Los Angeles, Calif.

Long Trip to Newsstand!

Sirs:

I have been threatening to write you for some time and express my feelings toward your magazine. Words can hardly express the thorough enjoyment I receive from it . . .

By the (letter) heading you have probably noticed the Lima, Peru, address. I have been down here almost 2 years and find things quite hard to purchase and also few substitutes. But I still keep going at it. One of the planes I fly regularly is the Upstart model with a McCoy 60, another is the Beelzebub. Both are good, consistent flyers. I have also made other of your models and every one of the plans has been satisfactory.

Oh, yes, maybe I should mention that I have been a pilot for 11 years and am now flying with P. I. A. (Peruvian International Airways). I pick up Air Trails in Panama (as that is as far north as I (*Continued on page 9*)

Letters to the Editors
All communications to the Air Trails editorial offices should be sent to Air Trails, Box 489, Elizabeth, N. J.

IN THIS ISSUE:

FURY		18
ATOM POWERED BOMBERS	William Winter	21
WE FLY THE HILLER 360	Don Downie	24
BRAYTON		26
RECORD FLIGHT	Betty McMillen Loufek	28
C.A.P. NEWS		30
DOUGLAS D-558-2 SKYROCKET	Alfred Owles	33
FAMOUS AIR BATTLES OF WORLD WAR I		34
AIR PROGRESS: THE R.A.F. STORY	Douglas Rolfe	36
PHOTO COMPETITION		38
DE HAVILLAND 4	Walter A. Musciano	39
THE SPONSOR SPEAKS	Dallas Sherman	42
PAA PAYLOAD WINNER	Herbert Kothe	43
BANSHEE	H. A. Thomas	46
GAY LADY V	Parker F. Hubert, Jr.	49
CRUISER	Charles Hollinger	63
MODEL OF THE MONTH: NEW ERA		64

DEPARTMENTS

Showcase		10
Development Highlights		14
Air Notes		16
Solo Club		32
Dope Can	Conducted by Val A. Luce	40
Sketch Book		48
Airmen of Vision		66
Contest Calendar		98
F.Y.I.		109
The Last Word		110

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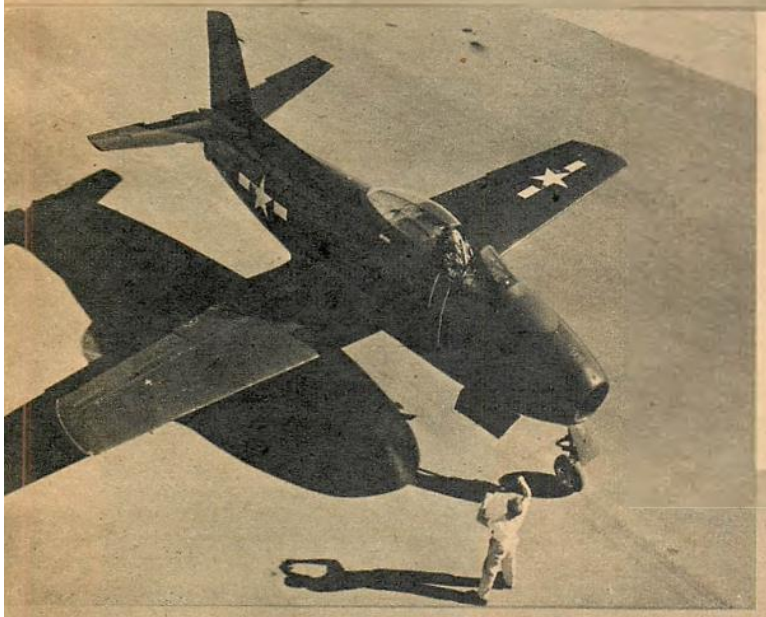
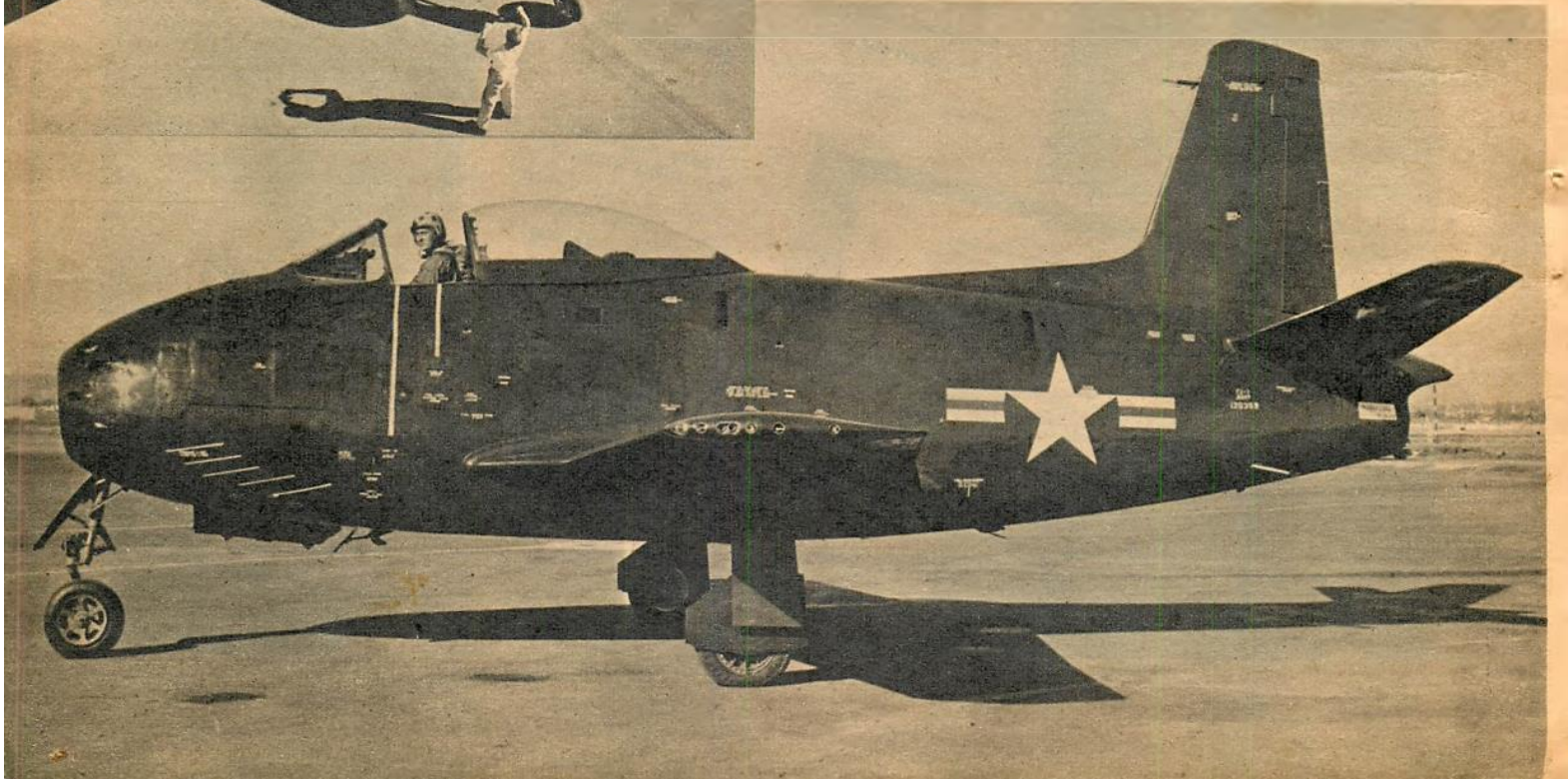
Fury!



STANDARD Navy carrier fighter, the North American FJ-1 Fury has amassed a number of impressive cross-country records piloted by members of 51st Fighting Squadron. One was the 1,135-mile flight from Seattle, Wash., to San Diego, Calif., in two hours, thirteen minutes. In order to deflect the hot gases of its 4,000-lb.-thrust Allison J35-A5 engine away from personnel or any aircraft parked to its rear on the flight deck of a carrier, the Fury is equipped with a kneeling device on its nose gear. The compact fighter has a wing span of 38′ 1″, the fuselage length is 34′ 6″. Fully loaded it weighs close to 15,000 lbs. Maximum speed is around 550 mph, range about 1,500 miles.



AIR TRAILS
MAY 1949

Atom Powered Bombers

By WILLIAM WINTER

Airplanes with unlimited range, even moon rockets are possible with atomic energy

ATOM-POWERED BOMBERS! How soon? How big? What shape? Will we see such aircraft in our time, or are they many years away?

Let's look at the record.

"In the event of war, or in any international situation likely to lead to war," declared the Congressional Aviation Policy Board in its report, *National Aviation Policy*, "nuclear energy for the propulsion of aircraft would be comparable in significance to the atom bomb itself." Both the Congressional Board and President Truman's Air Policy Commission urgently recommend that every resource and facility be devoted to the early accomplishment of atomic propulsion.

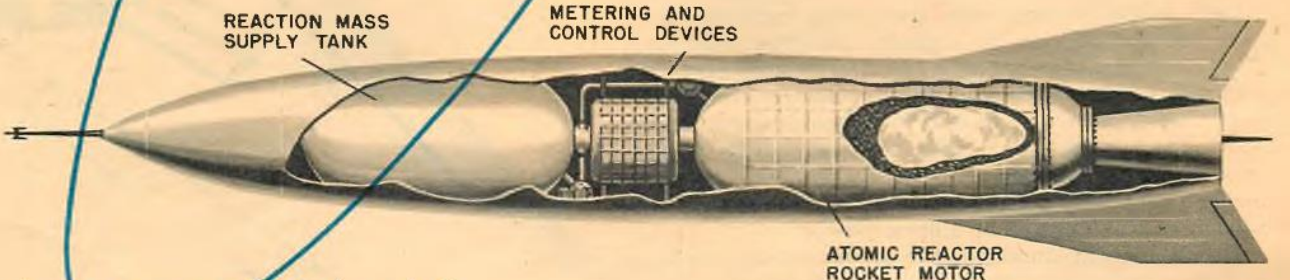
Because the means of delivering the atom bomb is as important as the bomb itself, the bomb would be worthless if its carrier did not have the reach to threaten objectives however distant, or the speed to foil all possible defenses which, in time, can be expected to counter any subsonic airplanes and missiles. Real speed with long range, designers say, can be provided only by the nuclear power plant whose fuel, per unit of weight, is 2,000,000 times as powerful as gasoline and whose duration, therefore, is virtually unlimited. But is atomic propulsion possible?

We can not only say that the nuclear engine is possible, but can describe within broad outlines how such a power plant will operate and can risk a rough estimate of the size bomber it might drive. It is possible to show the place of atomic power in the intercontinent, even space, rocket. Since all this is in conflict with the many statements that atomic propulsion is impossible due to the great weight of the shielding, it is encouraging merely to review the status of the NEPA (Nuclear Energy Propulsion For Aircraft) Project, at Oak Ridge, Tennessee.

"The possibility of employing atomic energy for the propulsion of aircraft and guided missiles," said the President's Air Policy Commission, "is sufficiently important to warrant vigorous action by the Atomic Energy Commission, the Air Force, the Navy, and the NACA. Some work of a preliminary nature has already been done by the AEC, the Air Force and its NEPA project."

Having begun operation on May 28, 1946, as an Air Force project, NEPA is administered by the prime contractor, Fairchild Engine and Airplane Corporation. Located in the old Fleclerc plant at Oak Ridge, this project also involves the NACA, various private laboratories and universities, and nine other power plant companies: Allison, Continental, Frederic Flader, Lycoming, Menasco, Northrop, Pratt & Whitney, Wright, and Westinghouse. NEPA cooperates closely with the Carbide & Carbon Chemical Corporation, operators of Oak Ridge National Laboratory, formerly Clinton Laboratories.

"Theory is 90 percent complete," David M. Poole, an engineer at Oak Ridge, was quoted recently in The New York Times. "The job now is up to the slide rule men with the drawing boards and working models." Head of the Thermodynamics Group, Poole explained that the scientists have thought out a way to tap the power of an atomic pile and that now the engineers must make the idea work, designing and building the engine, the plane, the controls, and working out the protection for pilots and crew. Andrew Kalitinsky, Chief Engineer of Fairchild's



Nuclear energy powered rocket

NEPA Division, admits that an atomic power plant has not yet been manufactured, and explains that the practical development of atomic energy calls not so much for new discoveries as for a great deal of engineering work.

Surprisingly enough, several basic types of power plants can be adapted for use with nuclear energy. Since the energy of fission is released mainly as heat, these all are thermal power plants, such as the steam or mercury turbine, the turbojet, the ramjet and the rocket. The source of heat, the nuclear reactor, is a relatively small atomic pile, through which the working fluid, that is air, water, or some chemical fuel, is passed for heating. In the case of the turbojet, as an example, the nuclear reactor simply replaces the familiar combustion chamber.

While the idea of the atomic power plant is beautifully simple in principle, its problems are actually enormous. To the man in the street, the riddles are seemingly insoluble. Typical teasers are these two: How can the heat within the pile be transferred to the working fluid without contaminating that fluid, endangering life and health, or, on the other hand, without causing corrosion of the magic material; and, how can the crew be protected from deadly radiations without making the shielding load hopelessly heavy. This last consideration becomes a real baffler when you realize that the working fluid, to be heated, must be admitted into the reactor *within the shielding* without permitting the escape of rays and particles deadly to humans.

While NEPA certainly won't divulge any vital facts and figures on anything as important security-wise as atomic propulsion, the many fascinating bits and pieces so far revealed, can be put together into several highly interesting pictures. Which is the one that counts? Here again there are clues, so the final answer to the plane—if it is a plane!—and its power plant is largely a matter of putting down your money and taking your choice.

Exhibit A is the modern bomber. Because it depends on chemical fuels, its required gross weight increases with both range and speed. At some given speed, its gross weight increases rapidly with added range as the fuel load assumes staggering proportions. Beyond a point—nearly reached as aerial refueling suggests—range cannot be increased regardless of size. If more speed is demanded, then range must be reduced. Atomic power is capable of both high speed and, for all practical purposes, unlimited range.

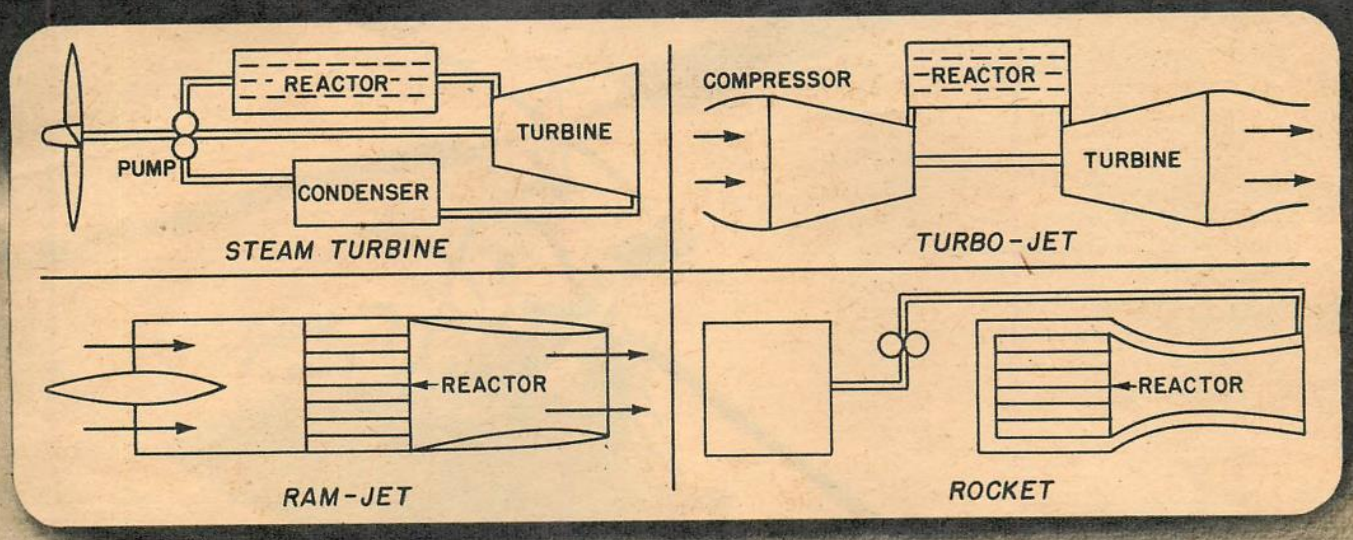
It is possible, of course, that the initial airplane might be one of less spectacular performance, being intended to demonstrate a nuclear power plant with a minimum of complications, such as would abound in a really fast, large airplane. A rough analogy would be the relationship between the Airacomet, first American jet, slower than the piston-engined Mustang, to the service jet fighters like the F-80 and F-84. But in all probability, the first atomic-powered airplane will be as fast as current design knowledge safely permits. Any service type would have to be fast or run increased risks of interception. "The atomic-powered airplane," says Kalitinsky, "must be designed for very high speed to take advantage of the special characteristics of atomic power."

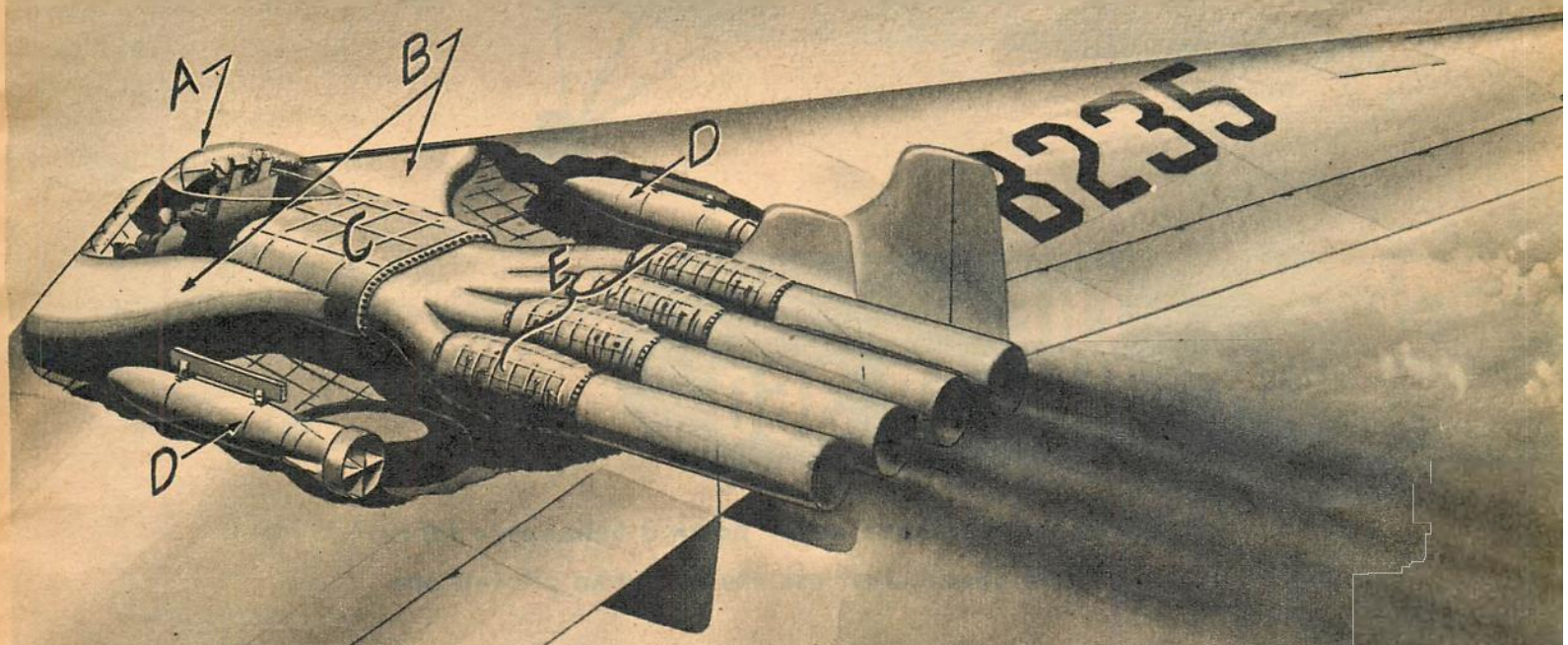
By all current standards the atomic-powered plane will be unique. Capable of at least 600 miles an hour, already reached by the B-47 Stratojet, it also will be a large craft in order to carry its many tons of shielding and a worthwhile pay load. Late in 1946, Doctor Luis Alvarez, famous nuclear physicist, was reported to have estimated a 25,000-horsepower motor would require 75 tons of lead shielding. This, he estimated, would mean a ship several times the size of the B-36, now the biggest plane in service. Dashing hopes of spectacular weight reductions in shielding through the use of miracle materials, Alvarez had stated, in effect, that there was no hope of finding a material with the magic property that a thin layer would absorb radiation. However, that was 1946. That other avenues of progress are open is indicated by a paper read before a Detroit meeting of the SAE in which Dr. Kalitinsky pointed out that there is considerable room for weight reduction by ingenious design.

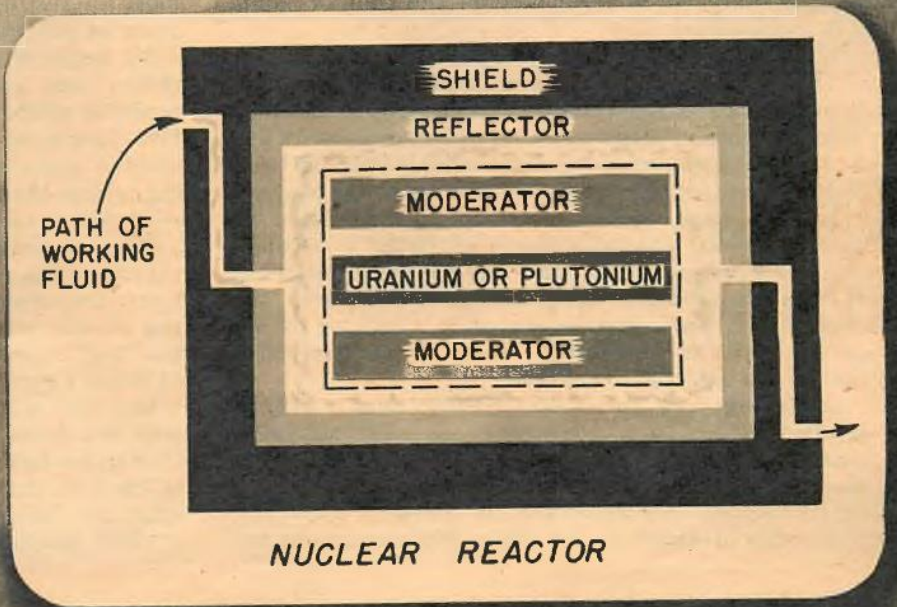
If, perhaps, dozens of tons of lead shielding make the atomic plane sound unlikely, a comparison with current large bombers indicates that 50 tons or more of this deadweight is by no means an impossible obstacle. The weight of the power plants, the fuel and the fuel tanks of the conventional airplane can be compared accurately with the weight of the engine—be it turbojet, turbine or any other type—and the nuclear reactor with its shielding. The reactor and its shielding can be of a weight roughly the equivalent of that of the fuel and tanks of the orthodox airplane. The weight of fuel and tanks in some large airplanes already has exceeded fifty tons, the B-36 for example, boasting a tank car capacity for gasoline. It is likely, therefore, that a large, fast airplane atomically powered can be designed and built. The question is: How big?

Again, the failings of the present day bomber provide clues. Until the two huge wheels of the B-36 were replaced by clusters of four smaller wheels each, airports capable of handling this giant could have been counted on the fingers (*Continued on page* 85)

● Shielding to prevent the escape of harmful rays is one of the major problems of the A-powered airplane because of the weight of the shielding material. There are three possible solutions: atom-powered missile requiring a minimum of shielding, launched by remote control methods; piloted aircraft where the crew quarters alone are shielded and the power plants are not; and (illustrated) an airplane with its power plant, mainly the reactor, encased in high-density material to prevent radiation. In the sketch, A is crew quarters; B, air intake; C, reactor; D, bombs; E, four powerful turbojet engines.







S. CALHOUN SMITH

We Fly THE HILLER 360

By Don Downie

For those who have never flown a helicopter there is a thrill ahead. Just ask the man who piloted one.

AND there we sat, ten feet off the ground, going backwards!

O.K., Mr. 'Copter Pilot, whaddya do now?

That's the exact predicament that this non-rotary-winged reporter found himself in recently at the Palo Alto, California, airport of United Helicopters. It was a cold pre-spring morning just a month after the CAA had licensed young Stanley Hiller's new "egg beater."

Luckily, there was an instructor along to show us the wild and wondrous ways of flying a "Hiller-copter." Previously this same day we had "soloed" in Hiller's single-place experimental model with the inventor himself standing alongside, checking us out on the throttles and "pitch stick" as we hovered a half-dozen feet off the ground.

The brand-new Hiller 360, N69085, was a $19,995 production model, and a check-out pilot was very much in order. After an hour and a half of take-offs, level flight, hovering and landing, the helicopter was still flying us—we weren't quite flying it. However, this series of flights in the Hiller 360 was one of the most interesting experiences of this reporter's dozen years of professional flying.

To begin with, flying a helicopter, even the 360, differs just enough from piloting a conventional powered plane to keep a pilot in hot water for his first couple of hours. There are so many different ideas to assimilate all at once: pitch *vs.* rpm's, hovering, going backwards, transition speed, autorotation —it's just a bit confusing, that's all.

When a visitor enters the United Helicopter plant in Palo Alto, he is immediately impressed by two facts: the newness of the building and the youth of the people working in it. This 36,000-square-foot building is just one year old, while the average age of Hiller's employees is less than 30 years.

Our first stop was "The Boss's" office. Along one wall is a mural showing all seven helicopter designs that Hiller has worked on since 1939. Hiller, now 24, is efficient, aggressive in a quiet way, and knows what he's talking about in helicopters.

"This helicopter of ours," he said with a little of

● Flying test-stand. Author Downie started his 'copter training solo-fashion. Stanley Hiller acts as instructor from ground.

● Hovering the Hiller 360. Downie, left, found that as a fixed-wing pilot he had to disassociate himself from many flying habits.

the pride of a new father, "is the sweetest-flying 'copter in the air today. It will fly hands-off and is completely stable. If you put it in a dive, it will oscillate a couple of times like a fixed-wing airplane and return to level flight.

"Just to show you how easy it is to fly, we'll take our experimental flying test-stand out back of the building and you'll solo out in it in less than ten minutes."

Well, after all, it was his helicopter.

We walked through the neat, well-lit assembly plant and out a door to the landing ramp—an oversized square about the size of a basketball court. Here was NX67707, the original experimental model for the basic Hiller design. It looked more like an old-fashioned primary glider than a modern flying machine, but it had been flown over 250 hours in short hops.

"This rig was built merely as a flying laboratory to prove some of the new theories we had for helicopters," said the designer. "It will fly very nicely, but it isn't fixed up at all like the 360 that you'll use later."

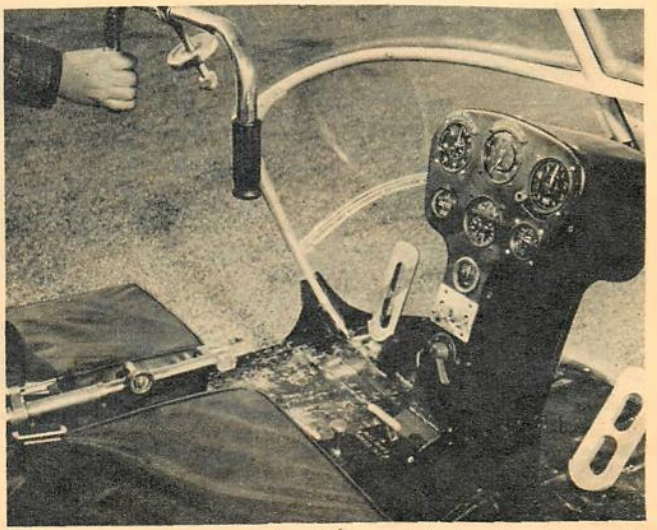
We climbed into the wide-open front seat, hooked our belt and looked around at Mr. Hiller. There was a second jump-seat just forward of the little 90-hp Franklin engine, but Hiller made no move to climb aboard.

"I'll stand alongside here and show you what to do," he said, and then grinned as he saw our dubious expression.

A battery cart was wheeled alongside and Hiller started the engine of the flying test-stand. The throttle and "pitch stick" were from an old Vultee BT-13 throttle quadrant. To make this helicopter go up, you merely pull up on the vertically-mounted throttle and "pitch stick" combined. To go down, you push down on the throttle and "pitch stick" together. Sounds simple, doesn't it?

The "pitch stick" is the control that regulates the angle that the rotor blades bite into the air, very similar to a controllable-pitch propeller. Both throttle and "pitch stick" are called the "collective" by the helicopter boys.

More-or-less conventional rudder pedals and stick control the in-flight movements of this helicopter. The stick, however, hangs down over your shoulder rather than coming up from the floor. By having the control stick connected directly to two small "servo-tabs," Hiller's design saves many pounds of weight and expensive machine parts. (*Continued on page* 73)



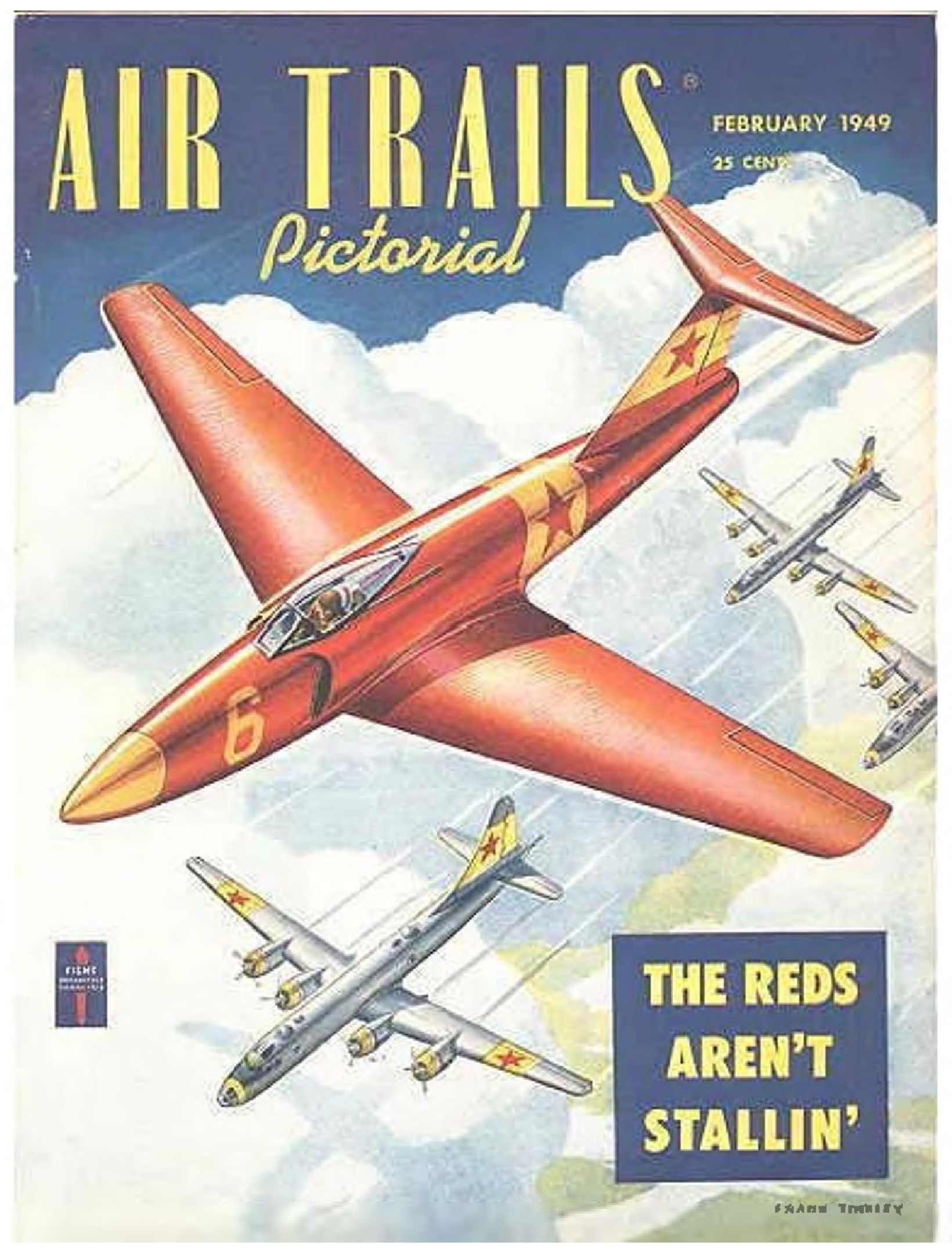
● Cockpit of 360. Note handle-bar of dual stick. Knob with screw is trim control; throttle and collective pitch between seats.

● Short rotor blades are servo-tabs that control rotor pitch. Note simple control linkage. Rear pipe is carburetor air intake.

AIR TRAILS®
Pictorial

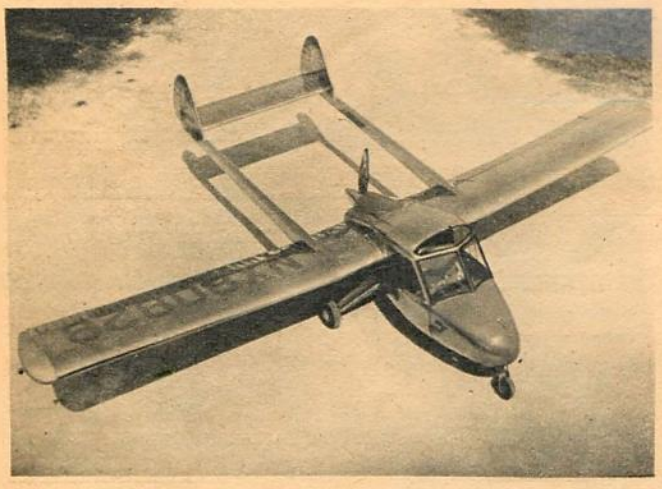
FEBRUARY 1949

25 CENTS



THE REDS AREN'T STALLIN'

FRANK THOMAS



● Anderson Greenwood 14, two-place lightplane powered by 90-hp Continental engine driving a pusher propeller. Fuel is carried in leading edge of wing. Nose wheel is steerable. Wing span 34', length 22' 7", top speed 110 mph, climb 700 ft/min.

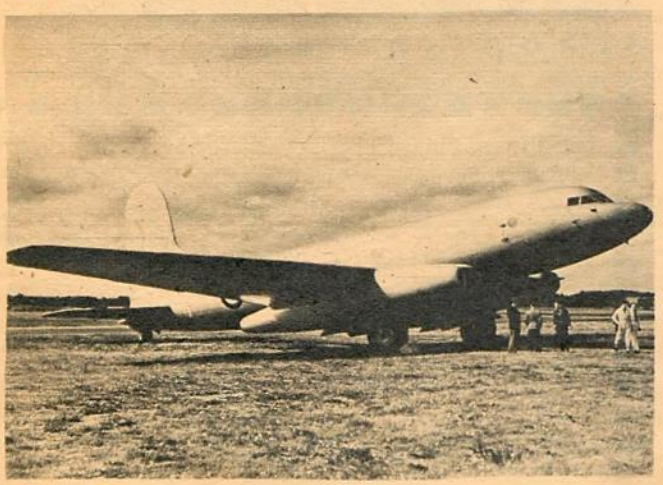
● Mock-up of latest entrant in the field of sonic speed, the Northrop X-4, now undergoing tests at Muroc Air Base. Features low-drag flying wing principle. Powered by 2 Westinghouse J-34 jets, 3,000 lbs. thrust each. Span 25'.

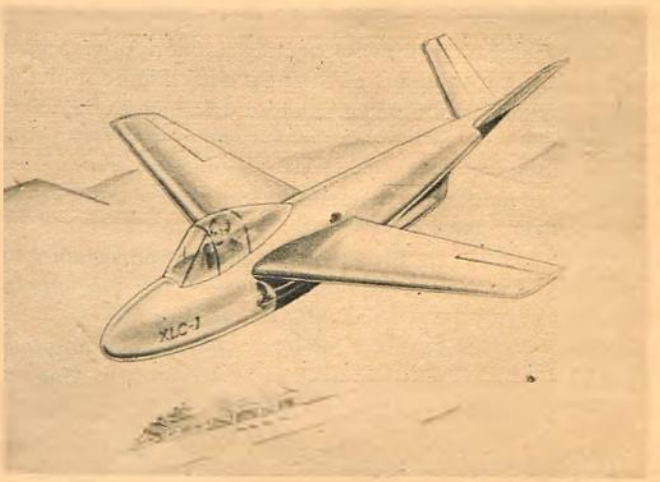
DEVELOPMENT HIGHLIGHTS

● Artist's conception of Navy's Convair XP5Y-1 patrol plane with performance comparable to land-based bombers. Two of the craft are on order. Powered by four Allison Turboprop engines. Span is 146', length 130', top speed 375 mph.

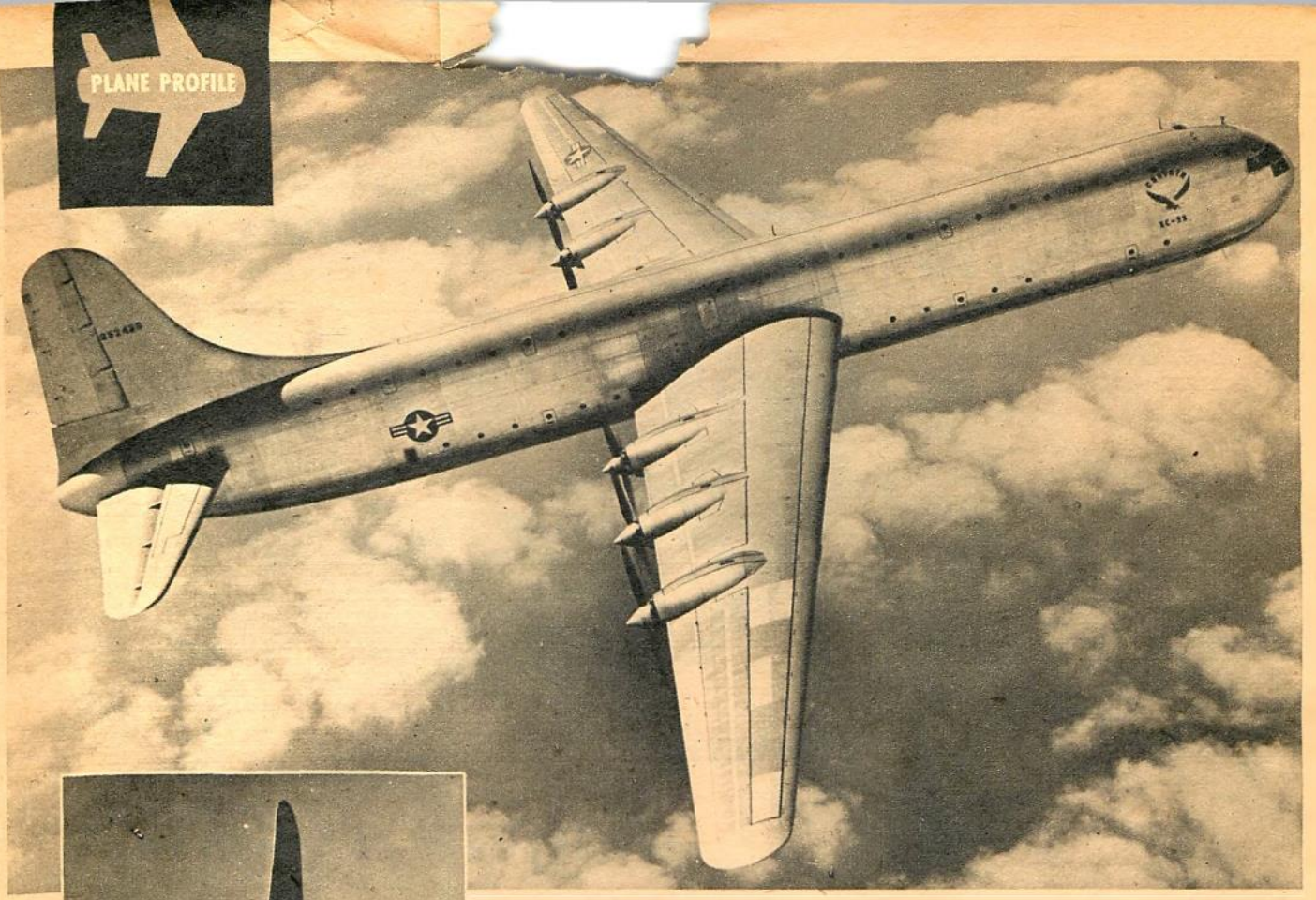
● Britain's jet-powered transport, the Avro Tudor VII, powered by four Rolls Royce Nene turbojets, two to each nacelle. Not intended for airline operation, craft is used as flying research lab to determine practicality of jet airliners.

● This small single-place jet plane with wing span of only 20' 10" was designed by students of Cal-Aero Tech., Glendale, Calif. Engine is of their own design, built around type "B" supercharger. May be used as pilotless target drone.





PLANE PROFILE

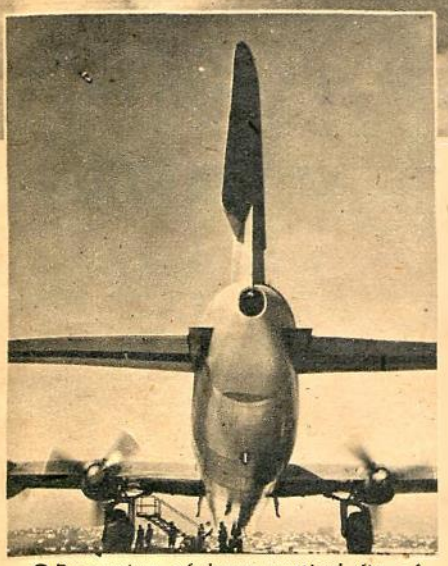


Consolidated XC-99

THE largest craft in the world at the present time, with the exception of the Hughes flying boat, the Consolidated-Vultee XC-99 is an experimental troop, cargo, and hospital transport. Its load capacity of 400 fully-equipped troops, or 100,000 lbs. of cargo, or 300 litter patients, dwarfs all transports of World War II.

The XC-99 is proof of the expanded use to which global air transport is to be put in the near future. Its six pusher engines have power equivalent to five locomotives, and the fuel supply, 21,166 gallons, would run an automobile around the world sixteen times.

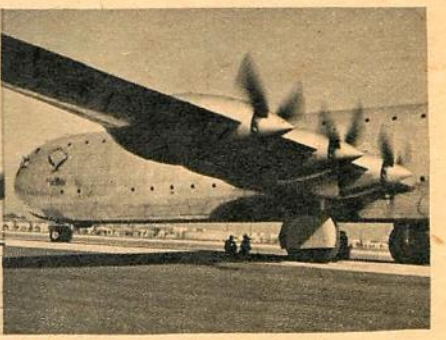
At the present time the airplane is undergoing intensive test-flying by Convair personnel, upon successful completion of which it will be turned over to the Air Force. The XC-99 has a maximum range of 8,100 miles with reduced loads and a service ceiling of 30,000 feet. The maximum speed is better than 300 mph. The wings and power plants are the same as those of the B-36.



● Rear view of huge vertical fin of XC-99 soaring 57 ft. into the air.

● Note how small man looks peering out of porthole. Fuselage 189 ft. long.

● Convair L-13 liaison plane is small enough to land on the 230-ft. wing.



● 6 pusher engines power the craft. P & W Wasp Majors, 3,000 hp each.

AIR TRAILS
FEBRUARY 1949

The Reds Aren't Stallin'!

RUSSIA IS MOVING AHEAD FAST IN THE DEVELOPMENT OF AN ATOMIC AGE AIR FORCE. HERE ARE THE LATEST SOVIET FIGHTERS AND BOMBING PLANES

BY JAMES L. H. PECK

THE American people were told by their leaders nearly a year ago that the Soviets were out-building us twelve-to-one in military aircraft. Outside the military and the aviation industry—both of which have been accused of wanting to start another war—the significance of the warning did not register the way it was expected to, if at all.

Now the disparity is put at fifteen-to-one. To this sobering news—coming at a time when our new USAF and Navy air forces are just beginning to take shape on the production lines—is added the completely reliable information that out of the busy Russian plants are flowing jet fighters comparable to the best of ours. Jet bombers and piston-engined, long-range bombing planes are in operational service.

Moreover, it is now conceded in military quarters that the Red scientists have held atomic tests and should require only a little time to get into production a compact A-bomb.

But this bad news, coupled with Russian behavior in Berlin and the Paris UN sessions, is an ill wind that blows at least some good in our direction. We won't make the same disastrous mistake of underestimating a potential enemy that we did once before.

Enough intelligence has been gleaned in bits and pieces through cracks in the Iron Curtain to show clearly that if the efforts of statesmen fail, here is what the U. S. and the nations of Western Union would be up against tomorrow:

A Red Air Force of about 15,000 first-line aircraft, including some 2,400 jet planes, which at this writing are in operational service. The jets include a long-range "frontier" fighter; four interceptor models, two of which boast a generous range; a "storm" plane for tactical operations; and a four-jet bomber. As the accompanying illustrations reveal, these airplanes are of a thoroughly modern design that indicates research activity of the highest order.

This is indicated, also, in the now-admitted fact that the Soviets penetrated the sonic barrier at least three months before our X-1 did the trick in October, 1947.

Turbojet development of equally high caliber is evidenced in the big power plants now in production for these aircraft and others. Among those known to exist are the widely-used 4,000-pound-thrust Chelomey engine, a 6,000-pound version of the same make, and a copied British Rolls Royce Nene rated at 5,000 pounds thrust. Moreover, they have made successful tests with a more powerful turbojet that features the new annular burner and is reported to develop between 7,500-8,000 pounds of thrust. This effort parallels advanced American and British jet research.

The always-excellent Russian ordnance is in evidence in the armament of the new craft, and there are reliable reports to the effect that along with the power plants and airframes of our B-29, the Soviets also successfully pirated our RCT fire-control system.

"Absolute weapon" activity is known to be widespread, with extensive research in guided missiles and a few of the more weird projects Nazi scientists didn't have time to finish before V-E Day.

This state of the Soviet Union is not quite so surprising to U. S. intelligence agencies—nor so recently come by—as the lay public might understandably believe at first hearing. Russian interest in jets, for

RUSSIAN CAST OF CHARACTERS

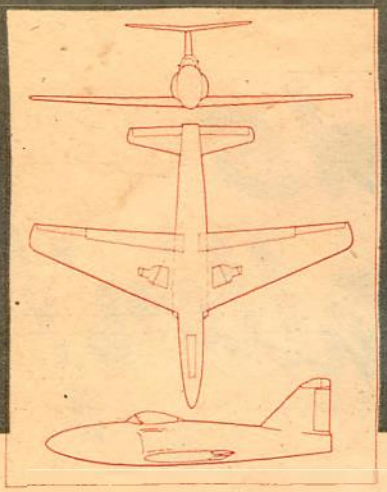
Chief, Red Air Force: Deputy Minister of Armed Forces, Konstantin Vershinin

Leading atomic scientist: Dr. Peter Kapitza

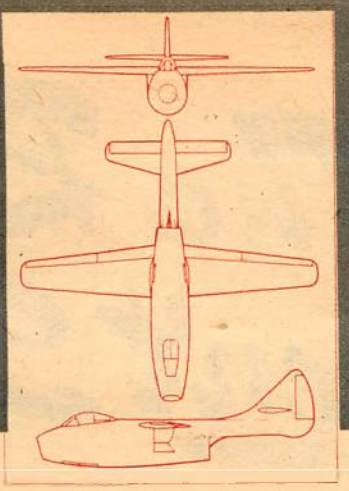
Leading aircraft designers: Tupolev, Yakolev, Ilyushin, Mikoyan, Gurevich, Lavochkin, Sukhoi

Promising new aero designers: Bratokin, Scherbakov

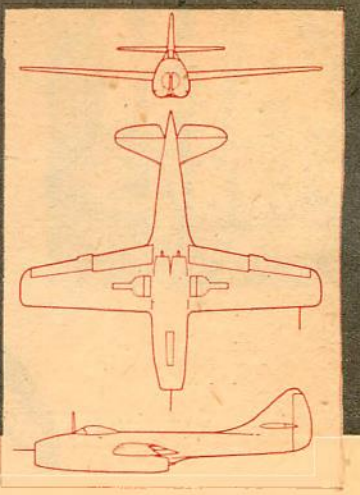
Leading designers who are deceased, but whose works may still influence current design: Petlyakov, Polikarpov



● High-speed research jet plane.



● Single-jet fighter by Mikoyan.



● MIG 7, interceptor with twin jets.

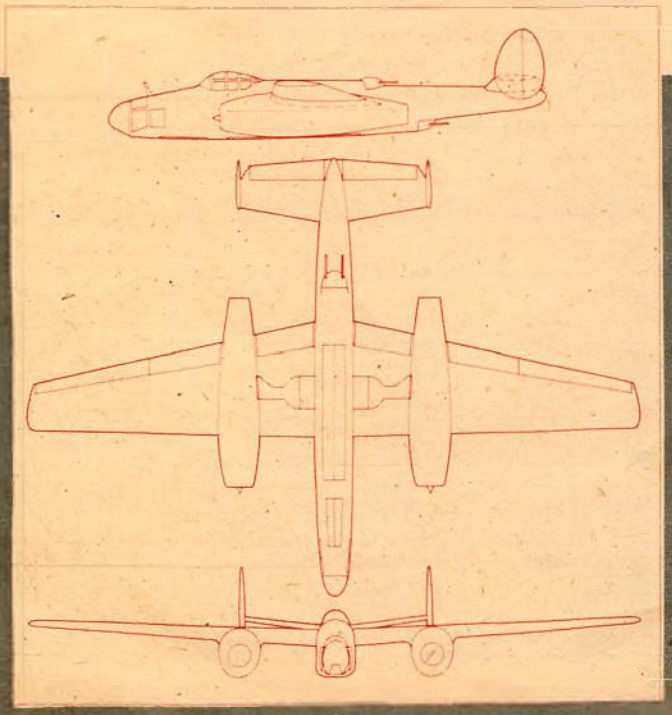
example, dates along with American efforts, and appears to have been equally independent of German influence in the earlier days.

To understand better how this state of aerial eminence came about, we look back to 1942 when the Soviets began the development of what they called a "reaction engine." The then leading jet expert, Andrei Kostikoff, was given carte blanche the following year by the Scientific Motor Institute (ZAIM), at Stalin's intercedence. By 1944, a hand-built YAK prototype was flying as far afield as Germany. This jet fighter performed well enough to survive several combats with Luftwaffe jets over the Berlin area.

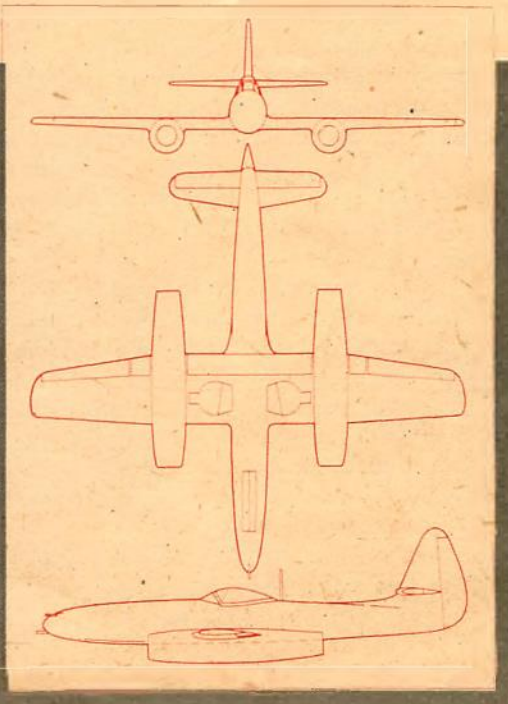
As the Red Army rolled forward towards the German capital in 1945, its mop-up squads were followed closely by secret police (MVD) units with a very special mission. This involved the recruiting of ex-scientists, technicians, and skilled workers—aeronautical and otherwise. Willing Germans were offered good homes, liberal wages, and extra rations: as an added inducement, they might even bring along their families. American Military Government officials have since estimated that at least 50 percent of the skilled workers in the Russian zone accepted; more than a few were persuaded to quit the U.S. and British and French zones before we started our own campaign to recruit German scientists. The plans, tools, and facilities that the Reds shipped home along with these erstwhile enemies constituted the richest prize the Russian government could have captured.

This involves the story, now well-circulated in intelligence circles, of the famous "two trains from Peenemuende." It seems that the Germans did not move as much equipment from this scientific center as we believed, following the destructive bombing raids of August, 1944. (They did move the great V-2 plant to an underground site near Nordhausen, but U.S. authorities later turned this over to the Russians anyway.) Valuable rocket test equipment and other gadgets, plans, and workers were loaded onto two trains for transfer to the USSR. They never got there, say folks with connections in the Polish underground.

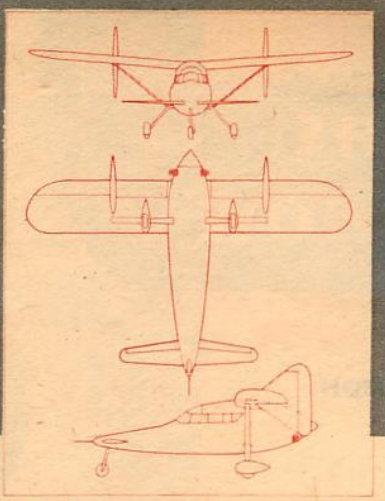
● Tupolev jet bomber, with two German Jumo engines.



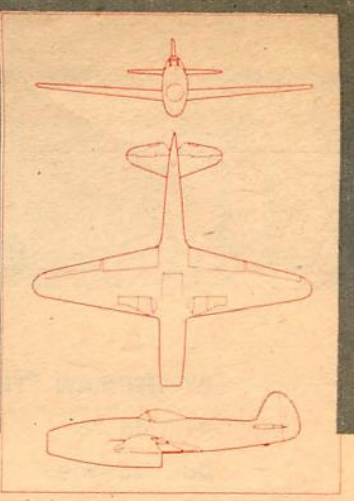
● La 8 fighter. Span 48' 4", speed 610 mph.



● Interceptor, designation unknown.



● The Utka utility plane, 145 hp.



● Single-jet Yak 15, interceptor.

Less doubtful is the fact that a lot of wind tunnels and valuable apparatus did reach Russia; the Reds were able to get to many of the best spots before ALSOS representatives and other U.S. technical intelligence teams arrived.

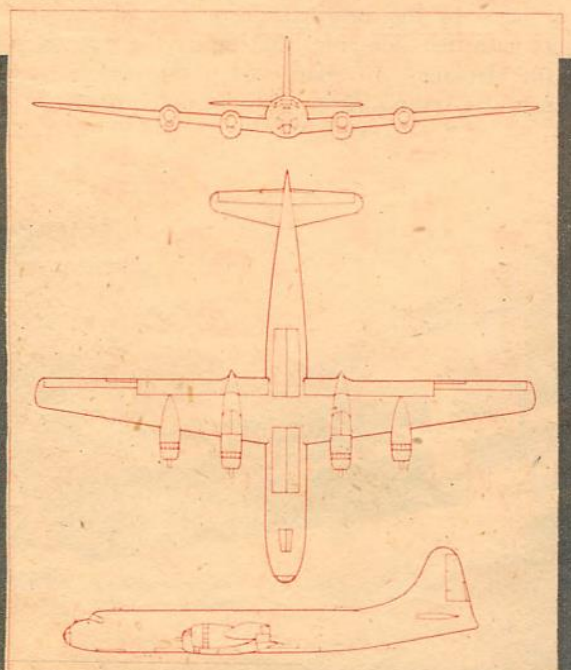
For the most part, these transplanted scientists were settled in a new center 24 miles from Moscow, under the watchful eye of Marshal Lavrenti Berea, MVD chief. The site was placed under the over-all jurisdiction of the Commissariat of Defense. A nearby airdrome at Ramenskoye was greatly enlarged and beautifully equipped as a flight test center, after the fashion of our Muroc base, under the direction of the very highly regarded Central Institute of Aero Hydrodynamics (VAIM).

The Russians took possession of the German DFS-346 supersonic research plane together with technical staff responsible for its construction. At the time they took it the DFS-346 was almost completed and ready to fly. The ship had three sets of wings built for it, one set straight, one with 20° sweepback and one with 45° sweepback. It had the most elaborate telemetering equipment ever installed in a research plane which left the pilot only with the task of flying. He did not even have to take down notes on a knee pad or remember any particular instance of flight, for the Askania telemetering device took it all down and relayed it to ground observers as well as photographed an elaborate instrument panel.

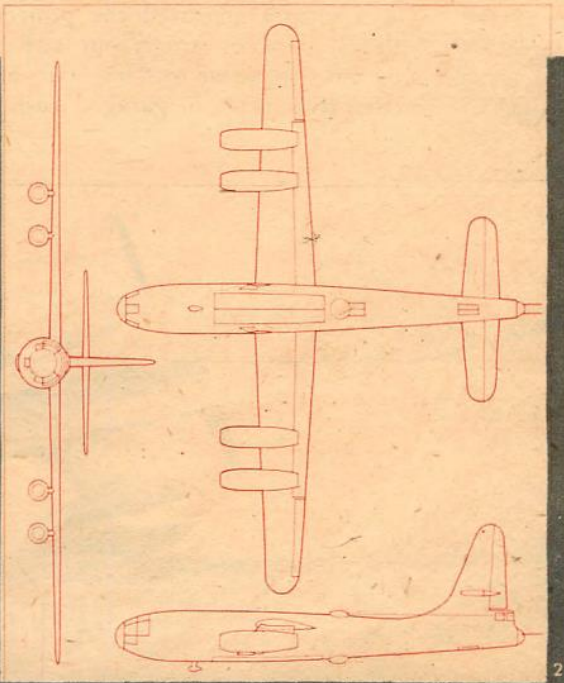
In view of the fact that the Russians had the 346 long before our XS-1 was completed, it is very possible that this was the ship they flew at supersonic speeds before us. The Germans believed that the 346 could reach the speed of Mach 2.5 at altitudes in the region of 75,000 feet.

The real significance of all this is not so much the fact that Red research is a good five years ahead of schedule because of the contributions of German brains and equipment; but that such marked progress has been made because they *were far enough advanced on their own to take immediate advantage of the most advanced German ideas.* The Soviets were *(Turn to page 93)*

● Bomber version of Tu 170. Existence not certain.



● Ilyushin four-jet bomber (remote-control turrets?)



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Pictorial

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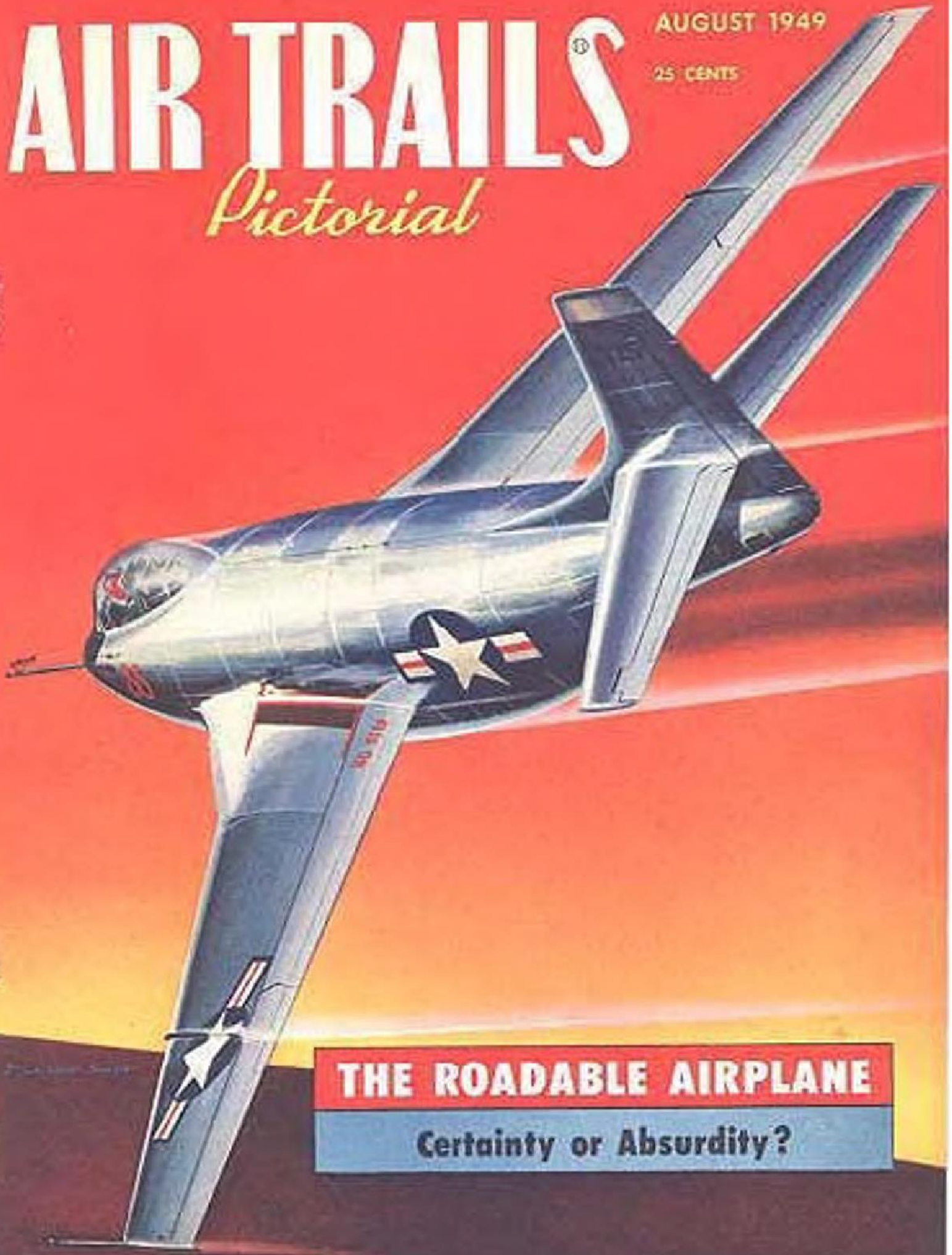


THE ROADABLE AIRPLANE

Certainty or Absurdity?

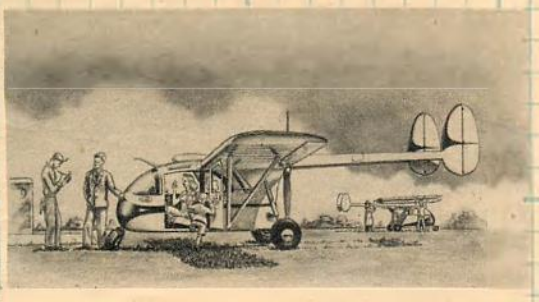
AIR TRAILS
AUGUST, 1949

THE ROADABLE AIRPLANE

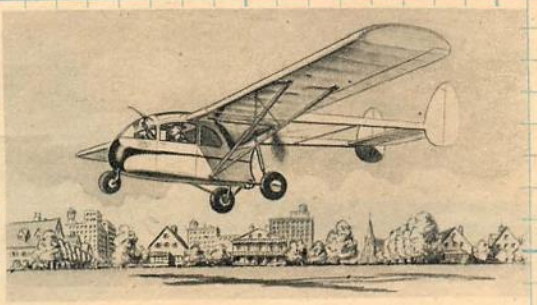
Certainty or Absurdity?

By ALEXIS DAWYDOFF

● Projected roadable airplane design by Henry Clark. The entire aircraft component is carried by the vehicle, securely latched to the roof.



● Arriving at the airport, tail is unfolded and locked into place. Wings and struts are then fastened to fuselage and plane is ready to fly.

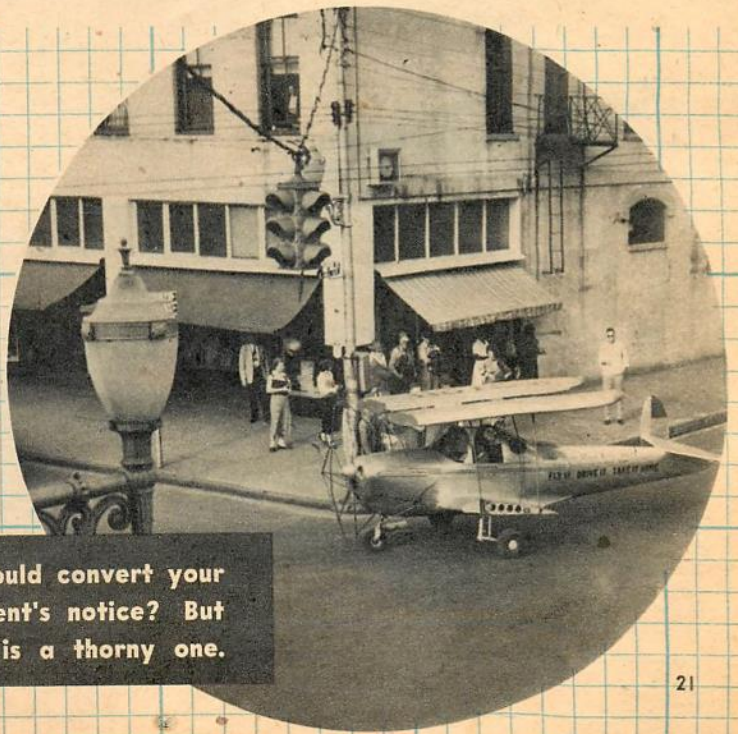


● Clark's roadable is a two-control airplane, leaving floor clear for clutch and brake pedals. Instead of flaps, it has spoilers atop wing.

SOME years ago, Jim Ray, at that time test pilot for Pitcairn Autogiro, was flying the company's small PA-36 on a cross-country trip. The weather became worse as the trip progressed, until it finally "closed in" completely. Undaunted, Ray set the giro down on a highway, folded its rotors and, engaging the rear wheel through a special transmission, drove to his destination. The PA-36 was a roadable autogiro, the only one of its kind. It now rests in the Smithsonian Institution.

Will all the roadable aircraft which have been produced, and those under development, become museum pieces? Will they become monuments to man's unsuccessful attempts to weld air travel with ground travel as door-to-door transportation? Will some of the problems be licked and the roadable airplane or the flying auto become practical? These are the questions which interest the aviation world.

The airplane of today does not have 100% utility as personal transportation from the point of view of the lay public. A transient pilot landing at an airport must scratch for a ride into town, and as airports are rarely located close to cities the process of reaching one's final destination is often involved and expensive. How simple it would be if one had an airplane that, upon pressing a button or turning a crank, would magically transform itself into an automobile, taking its owner to his business ap-



Wouldn't it be grand if you could convert your plane into an auto at a moment's notice? But the roadable designer's road is a thorny one.

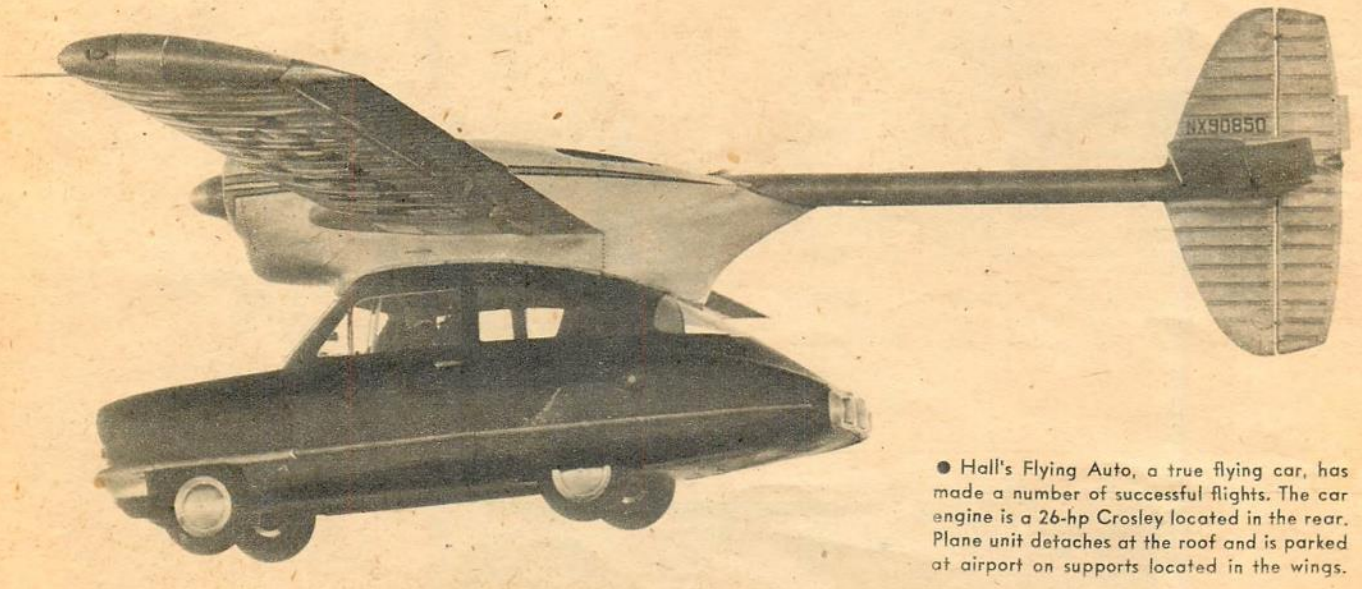
● The Fulton Airphibian has progressed far enough so that limited production is possible in near future. Craft performs well as car and plane. Has been widely flown here and in Britain. As auto, has front wheel drive.

pointment some ten miles from the airport! Men have worked for years to accomplish this ideal, and numerous examples of their labors are in existence at the present time.

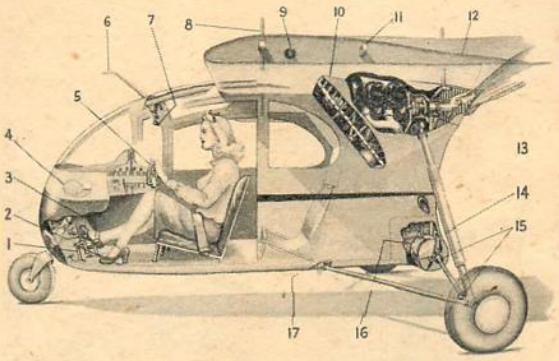
As far back as the early thirties, Waldo Waterman designed and built a few roadable Arrowbiles. This craft was a true flying wing of sweptback planform from which it earned its name. The wings were detachable. A 100-hp Studebaker engine operated both the propeller and the running gear. William B. Stout, famous designer of the immortal Ford tri-motor, is another believer in roadable airplanes who was working on the idea in that era—and is still preaching it.

There is a school of thought in the industry which does not consider the roadable plane as practical, claiming it to be neither fish nor fowl. "You cannot successfully combine an automobile and an airplane," they say, "and retain the good features of both." And it is true you cannot take an automobile, hang it under the airplane and fly away with it. Neither can you take an airplane, hook its engine to the landing gear, fold the wings and drive merrily down the highway. Both must be revised, redesigned and re-engineered in order that the blending may be a happy one.

And here, right away, the following question comes up: Which is best—a roadable airplane or a flying automobile? The term "roadable airplane" has been applied to all ground-air vehicles. Actually they are divided into two categories, the *flying automobile*, in which the car is the main unit and the airplane part is buttoned on to it (*Continued on page* 87)



● Hall's Flying Auto, a true flying car, has made a number of successful flights. The car engine is a 26-hp Crosley located in the rear. Plane unit detaches at the roof and is parked at airport on supports located in the wings.



● Cutaway view of Clark's roadable: 1—clutch, 2—accelerator, 3—foot brake, 4 headlights, 5—control wheel (ground and air), 6—pitot tube, 7—hand throttle, 8—wing support peg, 9—aileron push rod, 10—air duct, 11—wing lock fitting, 12—zippered gap flap, 13—prop shaft uncoupling and drive unit, 14—lower drive unit, 15—universal joint, 16—clutch housing, 17—strut bolt.

● Taylor's Aerocar: Tail and wings form trailer. Trailer wheels built into leading edge of wing at root. Car unit has already been built and tested, proved very satisfactory.

● William Chana, Consolidated-Vultee engineer, designed this flying auto which can be converted into pusher plane, canard or helicopter, using same car. 'Copter not shown.

"... it would be wonderful to run out the door, put wings on my auto, and fly ..."

"SEVERAL times in the last many years. I have criticized magazines for their handling of the story of an airplane which is strictly a publicity gag, a sales promotion, an out-and-out fraud, or which might be an honest effort of some inventor but never goes further than the prototype at the very most. . . .

"Beech, Ryan, Cessna, and all of them have some pretty fine engineers—probably as good as any—and they can't build those radical performing airplanes.

"The latest thing that came out is the flying automobile, and of course there has been a lot of publicity. The people in the companies that are building the flying automobiles are very sold on them—to the point where that is all they can see. They think they are going to put them out in quantities of 40,000 a year, and all that stuff. . . .

"All you would have to do in investigating it is go and watch it fly, see the room it requires to take off, the room to land, and how hard it is to fly, and then you would know [that it's a long way off].

"Air Trails . . . published a piece on the flying auto, and . . . you handled it very well. You gave the publicity that it was supposed to get, and published the pictures of it, but you didn't say that it was coming out in the morning and was going to revolutionize all the business, and so forth.

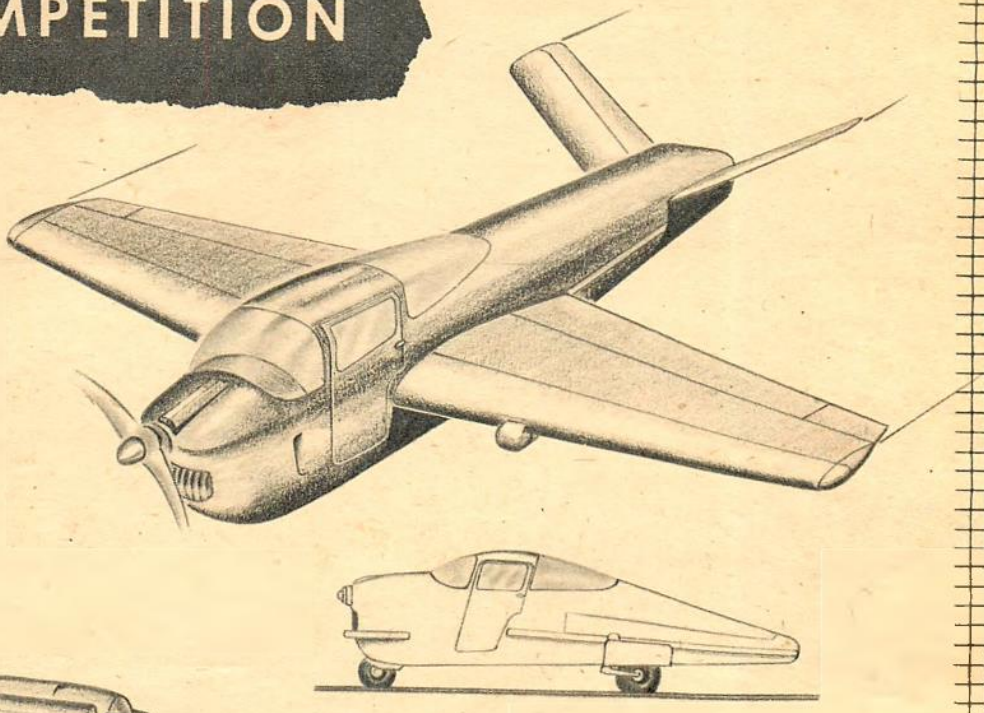
"Actually, and of course this is my own personal opinion, looking at those pictures, you can see that it will be a . . . job to fly that particular airplane under some conditions. From the standpoint of an idea only, it would be wonderful if I could run out the door here, put wings on my automobile and fly where I want to go, and probably some day we can do that. But at the present time there just isn't anything that will take the place of a good automobile and a good airplane. . . . you couldn't much beat a Plymouth or a Ford for your own use around the field, but that will cost you about $2,000; . . . a good, light airplane, such as the Cessna or something of that type, will cost about $3,500 . . . so the combination right there of an automobile and a plane, and one isn't packing the other, and you aren't trying to make something do for both that never will work out, costs a total of about $5,000 or $6,000.

"Now to build a combined article that will do both jobs equally well, is going to be a . . . job, and to sell it at a price that the public can afford will be another . . . job. With all the luck in the world wished to those who are building these flying automobiles, we have our fingers crossed.

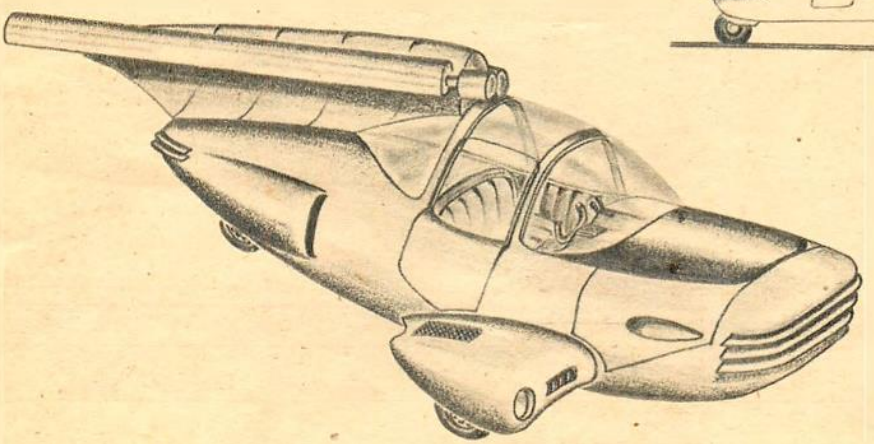
"We in the aviation business naturally need publicity to help us sell our various articles. That is why there is advertising by the companies. We are after publicity all the time. We don't want that to affect other people. We want to exist on our own efforts. We [are for] advertising by good legitimate companies, of something that they definitely are going to have to sell, not something they are planning way ahead of time and at a price you can't build it for . . ."

—LESLIE H. BOWMAN, President
General Aeronautics, Inc., Fort Worth, Texas

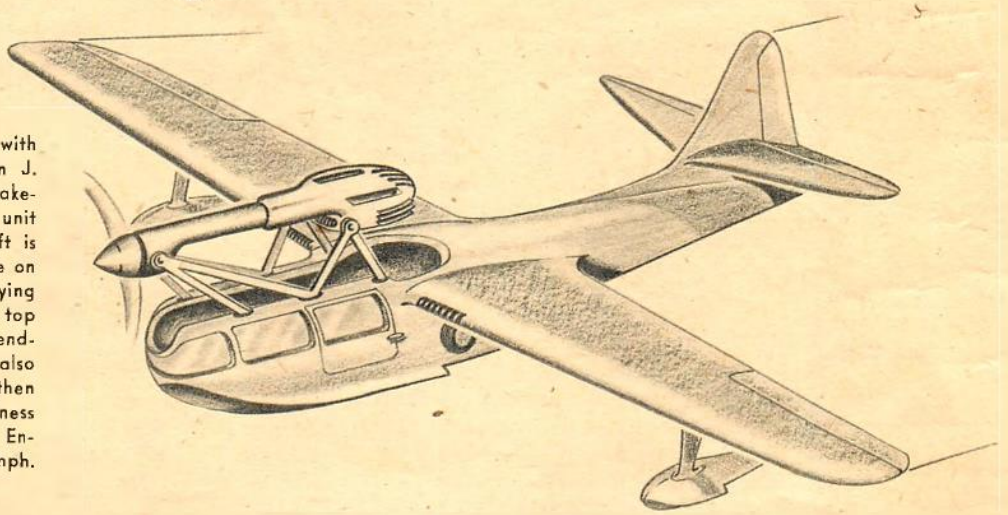
Airmen of Vision
DESIGN COMPETITION



● First prize: a roadable airplane by R. G. Naugle of Dayton, Ohio. A two-place all-metal monoplane powered by a 100-hp Lycoming which is used only for flying. An auxiliary 26-hp Crosley engine in forward keel of fuselage drives the dual nose wheels as a roadable craft. All main surfaces and propeller are retractable. Wings swing to the rear and are stowed in fuselage. Propeller blades are hinged at hub and can be folded inside engine cowl. Span, 22' 10".



● Second prize: a design by Stanton D. Dunn of Jeffersonville, Ind., for a roadable helicopter. For ground driving the counter-rotating rotors are folded backwards against vertical fin. Power plant is located in the rear, drives both the wheels or the rotors. For road work the craft has an automatic clutch and gearshift. Length, 15 ft.



● Third prize: an amphibian with retractable engine by Roman J. Szalek of Lasalle, Ill. For take-off or landing, the engine unit containing propeller and shaft is raised to allow prop-clearance on either land or water. In flying position the unit is flush with top of fuselage, the propeller extending forward. Wing tip floats also retract and the amphibian then compares favorably in cleanliness of design with a landplane. Engine, 185 hp. Top speed, 160 mph.

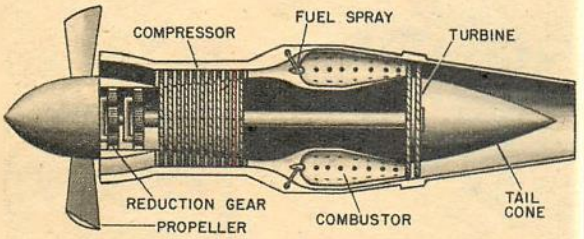
Air Trails has opened its columns to those who are interested in presenting plans for aircraft of the future.

Rules governing the competition are:

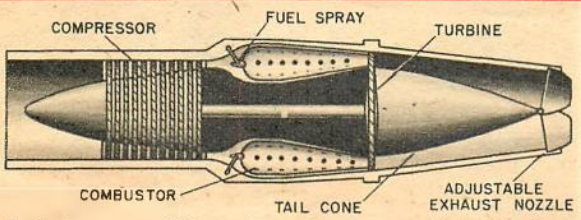
1. Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three views.
2. Sketches of the complete airplane in three-quarter front and rear position should be included.
3. Photos of a model of proposed design may be included.
4. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling is welcome.
5. Entries will not be returned and for that reason those participating should retain copies of all material submitted.
6. The editors regret they cannot enter into correspondence concerning designs submitted.
7. Designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-place sporting craft.
8. Mail entries to Airmen of Vision, c/o Air Trails, P. O. Box 489, Elizabeth, N. J.
9. The entry each month judged by the editors as the most practical or of the greatest significance will receive an award of $25. Awards of $5 will go to runners-up.

NORTHROP X-4 *An Air Trails Air-Pix* **by Alfred Owles**

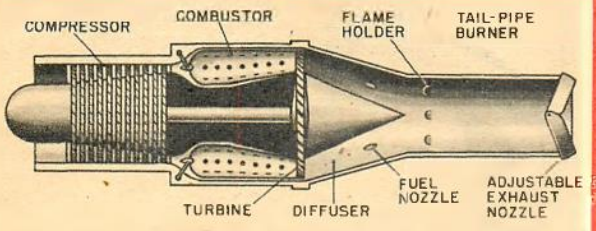
POWER to burn



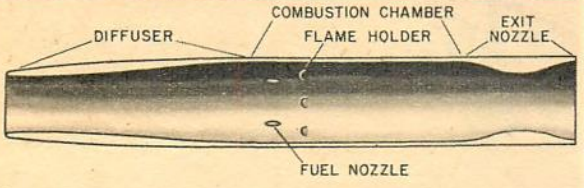
● Turboprop: capable of developing in excess of 10,000 hp.



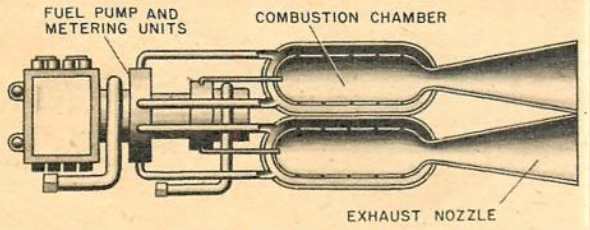
● Turbojet: most efficient when wide open at high altitude.



● Afterburner: raises jet temperature, lifts turbojet thrust.



● Ramjet: needs 400-mph speed to produce effective thrust.



● Rocket: power unlimited; doesn't depend upon air density.

How fast and how high you can fly depends on what type of power plant you are using

By RICHARD C. EARLY

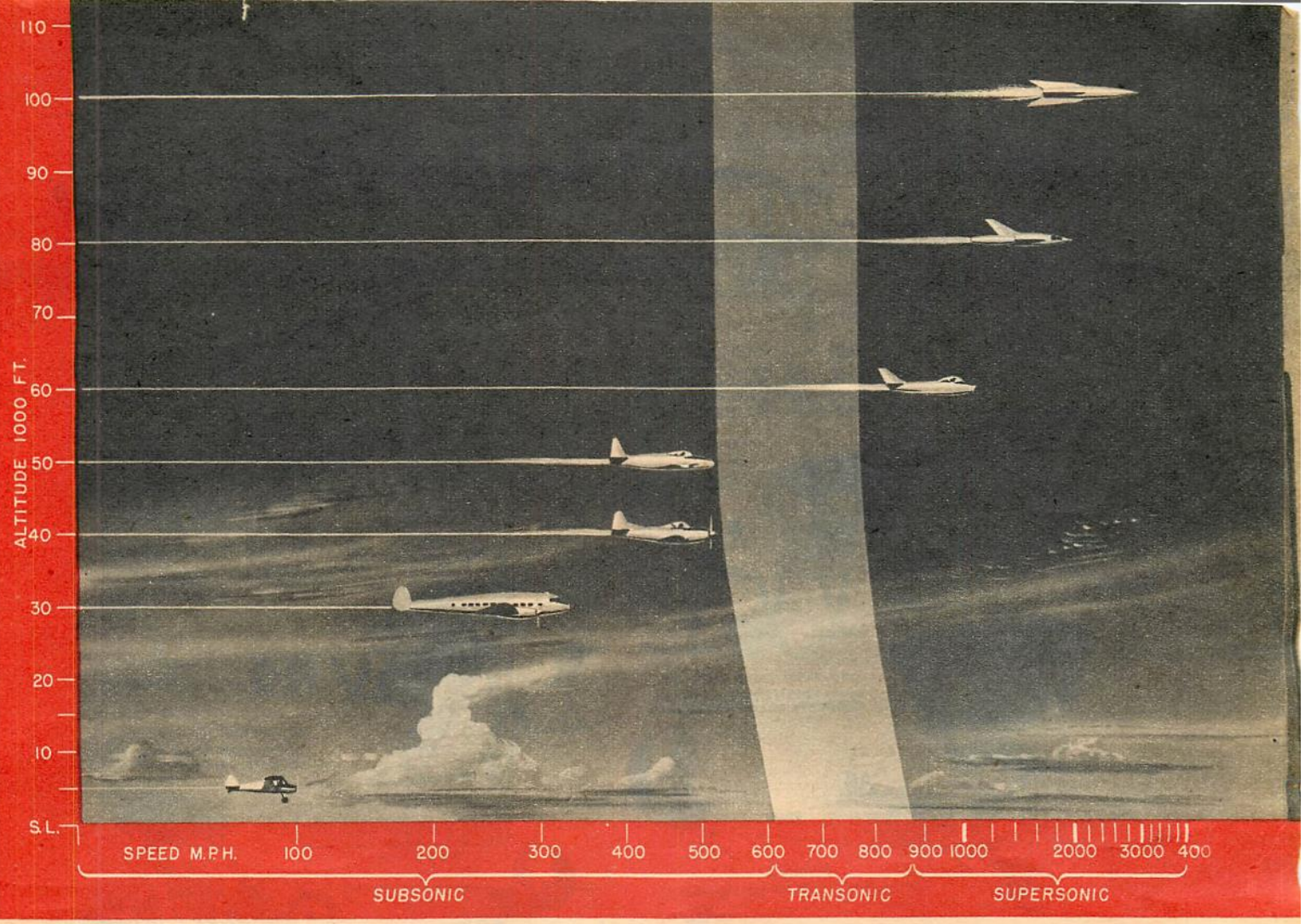
NOW that the sturdy Bell X-1 has for quite a spell been poking its inquisitive finger through the so-called wall of sound without burning up, as early prophets predicted, or shaking to pieces, as more modern engineers feared, the supersonic air age has indubitably arrived. The X-1, as every Sunday-supplement reader now knows, is a fairly ordinary looking airplane without even a supersonic sweep to its wings. Its rocket power plant, on the other hand, is more in keeping with Buck Rogers tradition.

This contrast of plane and power keynotes the entire supersonic picture. Today's layman takes any faster-than-sound airplane for granted. It may have sweptback wings or it may be delta-shaped like a paper dart. But what of the power plant? It would be no surprise to the experts if the average citizen figured you put a match to the rocket motor like a Fourth of July skyrocket.

Will the supersonic speedsters have to be rocket-propelled? How fast can the jets fly? What about the ear-splitting ramjet, or "flying stove pipe?" What's its value? How long and how far can these fuel-thirsty jets run on the fuel they can tote along? Does anyone know the answers?

Taking the last question first, the answer is *yes*. But the rest of the answers, if you guess, will win you no prizes at a quiz show. Imagine the full range of speeds from present-day transports to future rocket-powered passenger-carrying craft as a spectrum, just like the light spectrum, or a rainbow. In place of colors further imagine that the range of performance of each type of power plant appears on our spectrum as a band. Then, starting at the lower end, will be the familiar piston engine, the compound engine, and, working up through the middle section, the turbo-jet, turbo-ramjet, ramjet, and rocket.

In the engineer's jargon there is a simple way for locating each power plant on the spectrum. At some ideal combination of speed, fuel consumption, and range, each power plant will occupy a point where it reigns supreme. The engineer lays down two conditions: 1—the percentage of the initial gross weight of the airplane that remains as fuel and payload after the weight of the power plant has been deducted and, 2—the rate per mile that fuel is consumed per ton of



gross weight. The ratio of the first condition to the second determines the maximum range, or the point on the spectrum where the power plant in question is king pin. It will be noticed, later, that it matters little how atrocious the jets and rockets stack up at low speeds. When it comes to high speeds they are the most efficient means of doing a job, and not, as commonly supposed, a collection of aeronautical freaks good only for probing the speed of sound. It is all a matter of how fast you want to fly, say the scientists. If you want to fly fast enough, the noisy ramjet or the rocket may be the most economical way to do it.

Thinking in terms of the familiar subsonic world, we still are unaccustomed to the facts of the supersonic air age. At supersonic speeds, the cruising range grows quickly with increased flight velocities, reversing what we know of conventional planes and engines. A ramjet-powered fighter—if anyone could fight at such speeds!—might fly close to 4,000 mph before the snowballing drag of the airplane would overwhelm the increasing thrust of the accelerating power plant. For at those speeds you can translate pounds of thrust into horsepower and end up with six figures! At today's speeds the compound engine—one in which the surplus power of the turbo-driven supercharger is fed back into the engine by gearing—has the greatest range. It is a tough customer to beat down at the 200-mph-plus band of the spectrum. But as speeds begin to jump we must find power plants that give more and more specific thrust for their weight and for the frontal area of their required cowlings. Here is one reason why the ramjet—light and slim for its thrust—is far up on the spectrum while the big, bulky, and heavy-for-its-power air-cooled radial is at the bottom. Beyond the speed of sound a slim figure and brute power are essential. Much, much more power is required than we can imagine when we continue to think of present airplanes limited by their nature to an occasional thrust at the speed of sound.

A highly interesting report compiled by the staff of the NACA Flight Propulsion Research Laboratory in Cleveland, gives an exciting glimpse into the future of power plants and their ability to do a practical job at speeds starting on this side of the speed of sound and extending beyond it until only the sky seems the limit.

Moving upward from the low end of the spectrum where the piston engines and turboprop-jets are more or less limited by the effects of compressibility on their propellers, and into the stranger mid-section of the spectrum where the real excitement starts, we find the poorly understood turbojet. Here is a power plant with unsuspected possibilities. Here is a fertile field for the aeronautical Ripleys.

But how on earth can you compare such radically different power plants without actually having flesh-and-blood airplanes to put them in? To greatly oversimplify the convincing explanation of the researchers, the starting point is the assumed gross weight of the airplane for the power (*Continued on page* 77)

новое с боунстеллом и другими

AIR TRAILS

REG. U.S. PAT. OFF.

and SCIENCE FRONTIERS

A GREEN S STAUFF PUBLICATION

SEPTEMBER 1947

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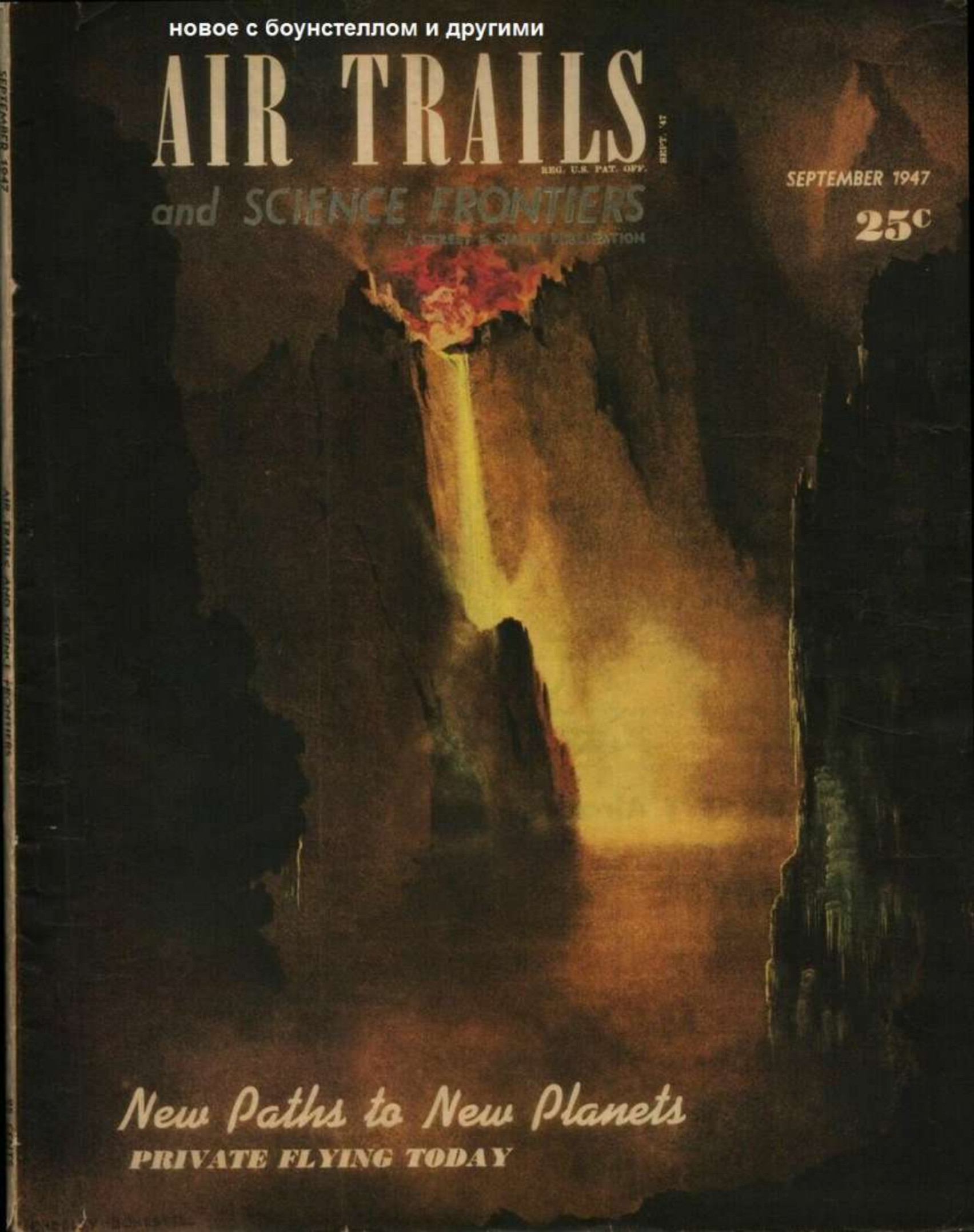
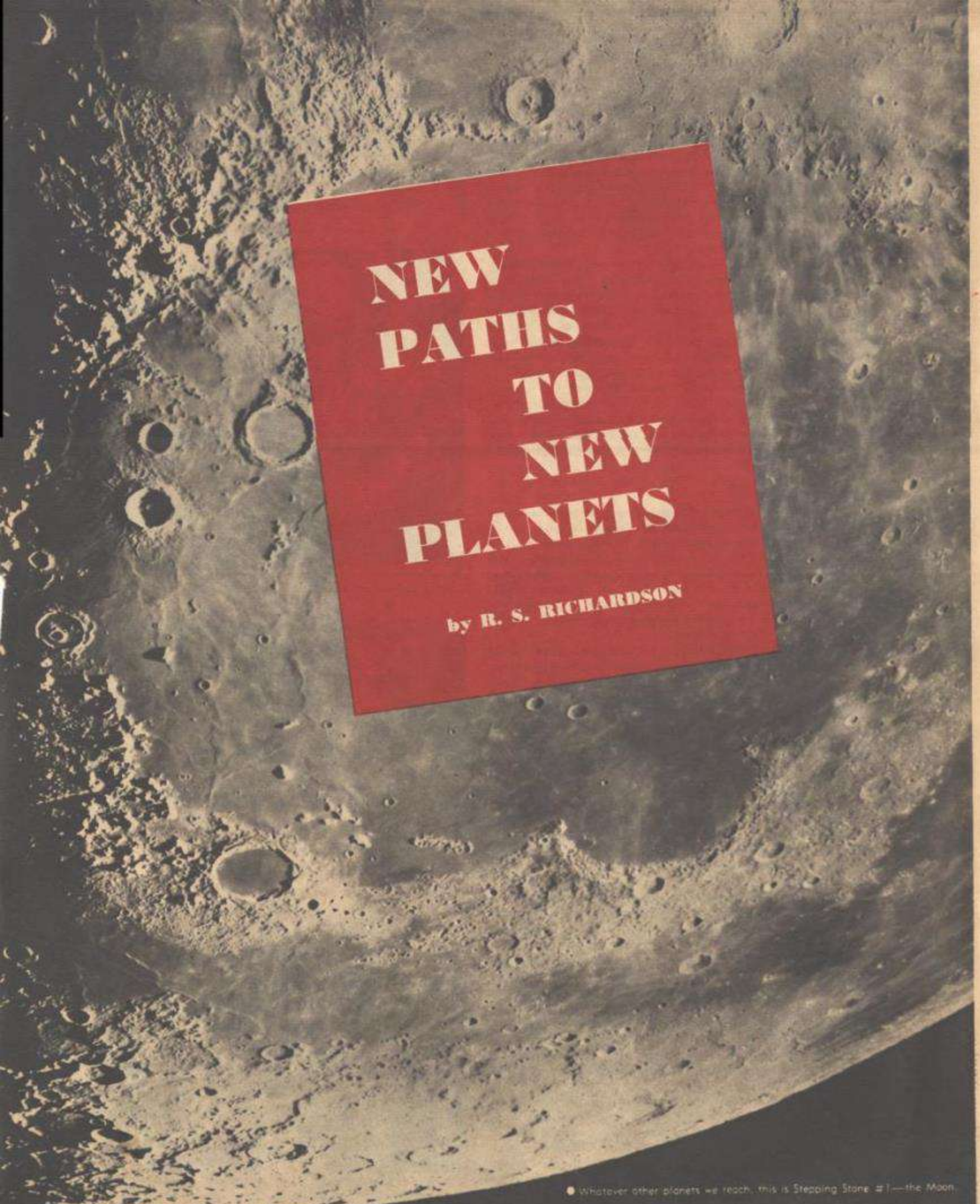


New Paths to New Planets

PRIVATE FLYING TODAY



NEW PATHS TO NEW PLANETS

by R. S. RICHARDSON

● Whatever other planets we reach, this is Stepping Stone #1—the Moon.

PLANES SWING THEIR COURSES NOW TO TAKE ADVANTAGE OF THE WINDS OF THE AIR. BUT THE INTERPLANETARY SHIPS OF TOMORROW WILL SWING TO THE GREATER "WINDS" OF SPACE—THE GRAVITY PULL OF SUN AND PLANETS!

Three Planets Discovered

SANTIAGO, CHILE.—Discovery of three planets at the Observatorio Ninguno, situated on a remote peak 9,000 feet high in the Andes, was announced today by the Director, Señor Romero Gonzalez. In a paper read before the Inter-American Scientific Congress, Dr. Gonzalez reported that photographs taken under his general supervision indicate the possibility that life may exist on at least one of the new worlds. The discovery, which was received with the greatest enthusiasm, was the result of a patient search. . . .

Such a flash coming over the wires would be big news indeed. Discovery of the outermost planet Pluto was hailed as one of the ten biggest news stories of 1930. Imagine the excitement aroused by discovery of three major planets revolving close to the earth! There would be a stampede by newspapers and picture magazines for the latest details. Double page spreads would show photographs of the new planets, the Observatorio Ninguno, its distinguished director, with small insets of his two assistants who did all the hard work. Noted astrononers would issue ponderous statements to the press and deplore the publicity to which they were being exposed, although actually enjoying every minute of it. Columnists would gravely discuss the possibility of repercussions on the good neighbor policy. A dozen spiritualists would claim they had prophesied where the planets would be found years ago.

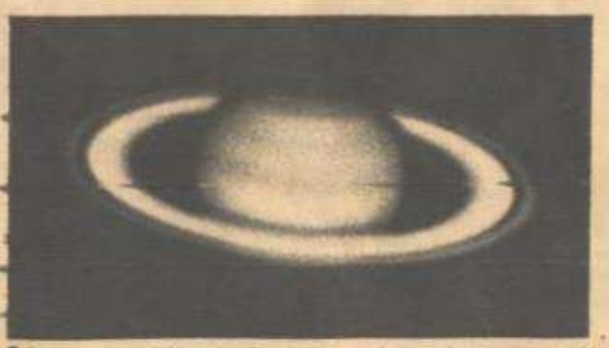
Unfortunately, the discovery of even one new planet now seems very unlikely. Clyde Tombaugh, who discovered Pluto, has completed a survey covering three-quarters of the sky, without detecting a single suspicious object among the 90 million star images examined. He had hoped particularly that some large asteroids might be found revolving between Saturn and Uranus, but here also was disappointed.

Yet, in a sense, there are three planets in the sky today that were unknown less than a generation ago. They are "new" in the sense that our conception of them is new. Their names are Venus, Mars, and Jupiter. Certainly the accounts of Venus and Jupiter written before 1920 bear scant resemblance to those in textbooks today. Our picture of Mars has not altered so radically, but the outline is more definite than before and the whole image is in much sharper focus.

Progress in planetary research during the past thirty years seems pitifully slow compared with the rapid strides that have been made in stellar astrophysics. This is due partly to lack of workers in the planetary field as well as the intrinsic difficulty of the subject itself. Incredible as it sounds, analysis of the atmosphere of a planet a few million miles away is a much more difficult undertaking than analysis of the atmosphere of some star millions of millions of miles distant. The stars are luminous bodies with atmospheres composed of simple elementary substances. We can turn our telescope on a star, take a photograph of its spectrum, and within a few minutes state that its atmosphere contains the elements scandium, magnesium, and calcium, that the surface temperature is about 20,000° F, and that the star is moving toward the earth at the rate of 12 miles per second. But the atmosphere of a planet is visible only by reflected sunlight. If it absorbs certain portions of the sunlight or leaves some other mark upon it, we may be able to identify the gases it contains. But identification is complicated by the fact that our own atmosphere absorbs sunlight strongly, so that possible faint planetary markings have to be disentangled from those made by the terrestrial gases. Also, a planetary atmosphere is not composed of simple elements

● Jupiter—the Solar System's giant. Ten times the diameter of Earth, its atmosphere is some 12,000 miles deep. And colder than our South Pole! Gasoline would solidify there.

● Mars, the most talked-of planet, definitely has atmosphere and plant life. Probably there are some lower insect-like animal forms, too; but no men—yet!



● Saturn, second biggest planet, has so low a density it would about float in water. It, too, is mostly gas, colder than Jupiter.

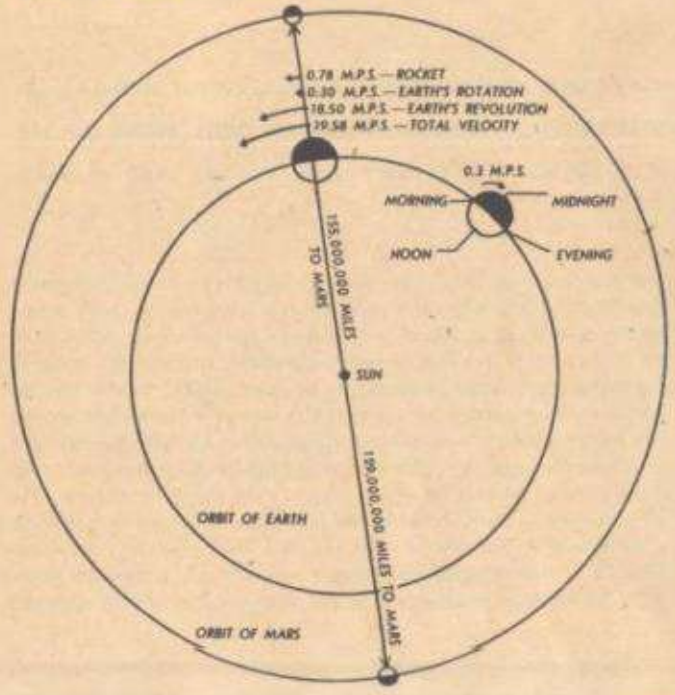


Fig. I. The large, or economy size, route to Mars, involves an elliptical orbit; to establish such an orbit, a rocket must move 19.58 miles per second. But that can be made up of Earth's own speed in its orbit, plus Earth's rotation, and only 0.78 m.p.s. extra. Sadly, however, it takes an added 6.77 m.p.s. to escape Earth's gravity. V-2 easily exceeds ¾ m.p.s.

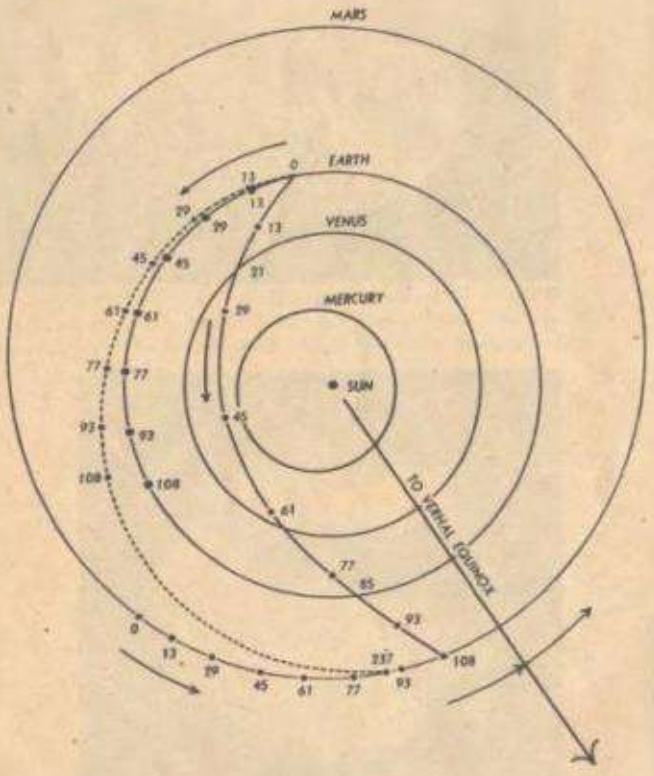


Fig. II. Comparison of the larger, slower, but less fuel-consuming classical orbit (dotted) with the high-speed hyperbolic orbit to Mars. The figures on the orbits show days-after take-off, with the positions of Mars, Earth, and rocket shown at corresponding times. Calculated for the fast orbit in this case, the slow orbit will bring the ship to Mars' orbit months after the planet has passed the intersection. The slow orbit calls for different times.

like that of a star but of compounds, which may never have been studied in the laboratory from an astronomical point of view.

Reviewing the record of planetary exploration since the time of Herschel about 1780, one cannot help wondering how much farther we may expect to go depending upon earth-based telescopes alone. You can look at a planet night after night through a big telescope and see nothing that was not familiar to astronomers a century ago. It is true that the photographic plate, the spectrograph, and the vacuum thermocouple have contributed much that was beyond the reach of visual observations. Undoubtedly, new electronic techniques will contribute much more in the near future. Yet the uneasy feeling persists that the present quest is hopeless. That the only way to know what is on Mars is to go there and find out.

Already rockets have been sent to altitudes above 100 miles to study meteoritic phenomena in the upper atmosphere. Rocket photographs of the solar spectrum have been obtained that show lines impossible to observe from the surface. The Army has stated that if necessary a small mass could be placed upon the Moon within less than ten years. Of course, sending a manned rocket to the Moon or Mars is a problem of a much higher order of difficulty, which in my opinion is still far from solution.

There is no reason, however, why certain aspects of space travel cannot be discussed now as well as a hundred years from now. I feel confident that in 2047 Newton's laws of motion and the law of gravitation will still be in operation, and that the same formulae will be used in applying them. Here is one field in which nothing really new is likely to be uncovered.

So let us proceed to examine these new planets that loom in the sky today, and in imagination plot the paths that will lead us to them tomorrow.

The Cheapest Route to Mars

The most economical way to send a rocket to Mars (or any planet) is to give it just enough velocity to carry it to the desired point of contact and no farther. Once the rocket is properly launched no more energy need be expended to keep it moving, since there is no friction in space. Theoretically, the rocket should faithfully follow its prescribed path as effortlessly as the planets revolve in their orbits. Sending a rocket to Mars might be compared to rolling a ball up an incline into a basket at the summit. In both cases, work must be done against gravity. When going to Mars, we must do work against the attraction of the Sun and Earth. On the incline, work is done against gravity at the surface of the Earth. We will get the ball up the incline with the least effort by starting it just fast enough so that it barely attains the summit and topples into the basket. Too little velocity will cause the ball to roll back again. Too much velocity may cause it to fly on past the basket.

Figure I shows the orbits of the Earth and Mars. The orbit of the earth is almost a perfect circle with the sun at the center. The orbit of Mars is slightly oval, with the sun noticeably off center. At the point A on the orbit of Mars the distance to the Sun is 155 million miles; while at P, the point nearest the Sun, the distance is only 129 million miles. As we are supposed to be on a very limited budget we will therefore aim for P, since we would be foolish to do any more work than is absolutely necessary.

Calculations show that a body launched from a point on the orbit of the earth needs a minimum velocity of 19.58 miles per second in order to reach Mars at P. Now the Earth moves in its orbit with a speed of 18.50 miles per second, and rotates at the equator with the speed of 0.30 miles per second. Inspection of the greatly exaggerated figure of the Earth shows that at midnight the point M will be carried by rotation in the same direction that the earth is revolving in its orbit. Thus, by launching the rocket horizontally toward the east it will acquire a speed of $18.50 + 0.30 = 18.80$ miles per second, with no cost to us whatever. In fact, all the speed we have to give the rocket ourselves is a mere $19.58 - 18.80 = 0.78$ miles per second.

I can hear someone in the back of the room rise up and demand, "Why wait any longer? We can give a rocket that much velocity right now. I want to start for Mars tomorrow!"

The answer is that we have vastly oversimplified the problem. The path we have described is what might be called the classical route to Mars, to borrow a favorite expression from the atomic

(*Turn to page 39*)

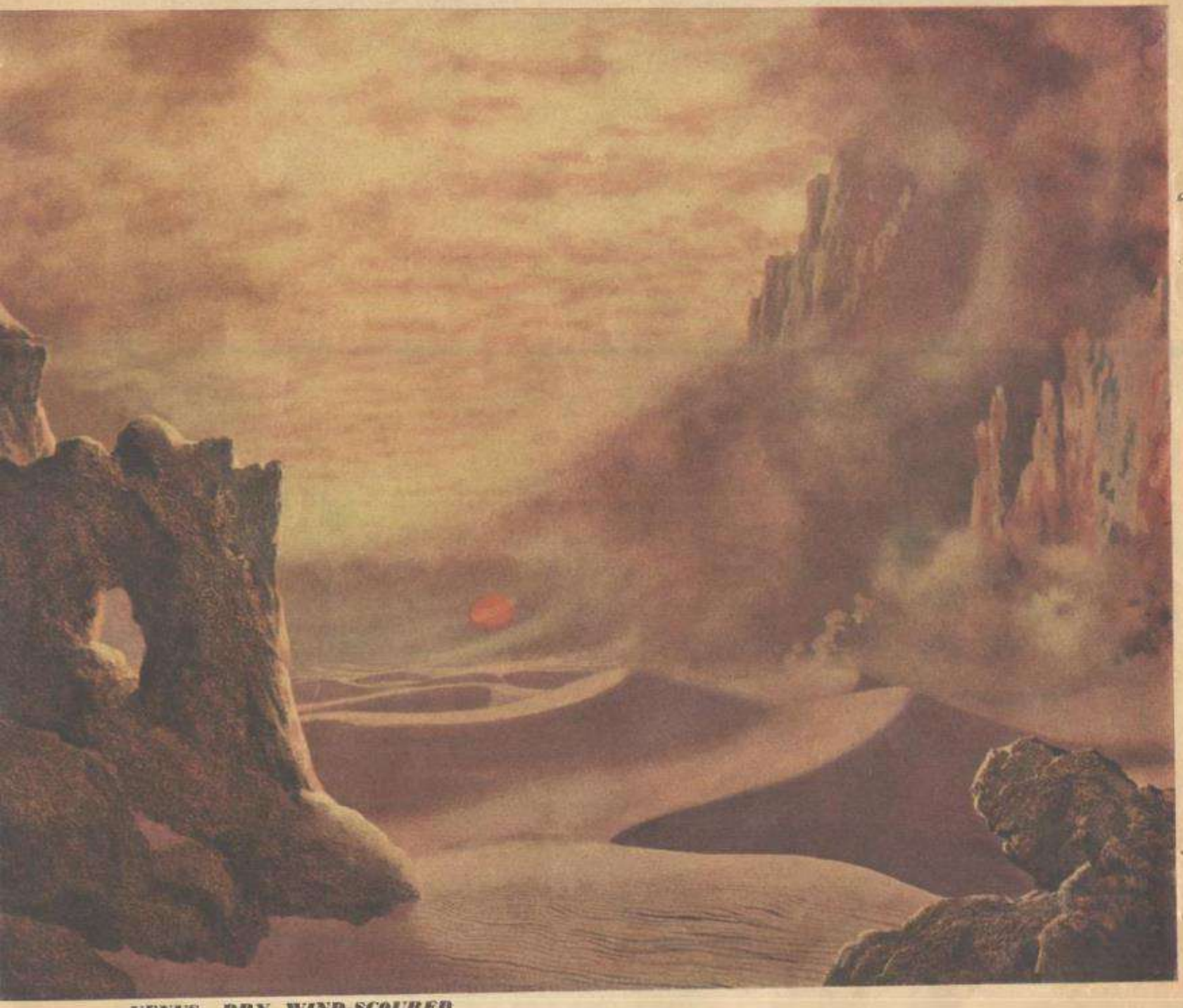
MARTIAN LANDSCAPE

● Going up! The automatic camera caught this view looking downward from a rising V-2 at the 35-mile level. As a super-elevator for measuring and recording devices, V-2 is still tops, although new types of rockets now under development promise ultimately to surpass it.

● Another view from V-2, this one at the 45-mile level. Even large areas of high cloud seem to float very close above their shadows on the surface beneath. Topographical features are drawing together into the appearance of a good relief map as the altitude increases.

● This way out! Out to the stars, that is. This vista of the horizon and the darkling background of space beyond is one no living creature on this planet has viewed directly—yet. From 65 miles up, 40,000 square miles of surface are visible stretching away to the horizon 720 miles distant. Mankind will some day travel this road to the moon . . . and beyond.

● From 60 miles up, the earth directly beneath definitely has the wrinkled, foreshortened look of a topographical map. Such pictures may have important practical applications.



VENUS—DRY, WIND-SCOURED

physicists. This is the route discussed in all the books on inter-planetary travel. It is important because it is the fundamental basis for all discussions of inter-planetary travel. But you would never get to Mars or even the Moon by following the directions as stated. In the first place, the resistance of the air would stop the rocket almost before it got started. But even neglecting the air, gravitation would soon put an end to the project. A rocket launched horizontally from an elevation of 500 feet with an initial velocity of 0.78 miles per second would land—not on Mars—but somewhere over in the next township about 5 miles from the starting point.

To send a manned rocket to Mars, engineers must somehow devise a way to launch it gently into space at a low speed until at a height of around 200 miles, when it is essentially in a perfect vacuum. Then the speed must be stepped up gradually to at least 6.77 miles per second in order to leave the Earth. Such a rocket will be able to reach the orbit of the Moon. In order to reach the orbit of Mars, a velocity of 7 miles per second at 200 miles elevation will take it there in 259 days.

Ellipse vs. Hyperbola

As a home-loving individual who dreads the thought of packing a suitcase for a week-end trip, I shudder at the thought of trying to stow away enough water, oxygen, food, etc., to last a crew of three people for 259 days, within the limited interior of a space ship. Worse still, for a person with a disposition like my own, would be the strain of trying to live in such close contact with anybody for 259 days. A couple starting for Mars on their honeymoon would hate each other by the time they arrived at the end of the line! And we still have made no plans for a stopover on Mars itself or the trip back!

It is my contention that if space travel is ever going to become a reality we must speed things up considerably. The trouble is that all calculations have been based upon minimum energy requirements, which naturally demand more time. But if we have barely sufficient fuel to reach Mars by the most rigorous economy, then we have no business attempting to go there in the first place. Far better to wait another hundred years until powerful fuels are developed that will take us to Mars in fast time with a comfortable margin of safety.

(*Turn to page 72*)

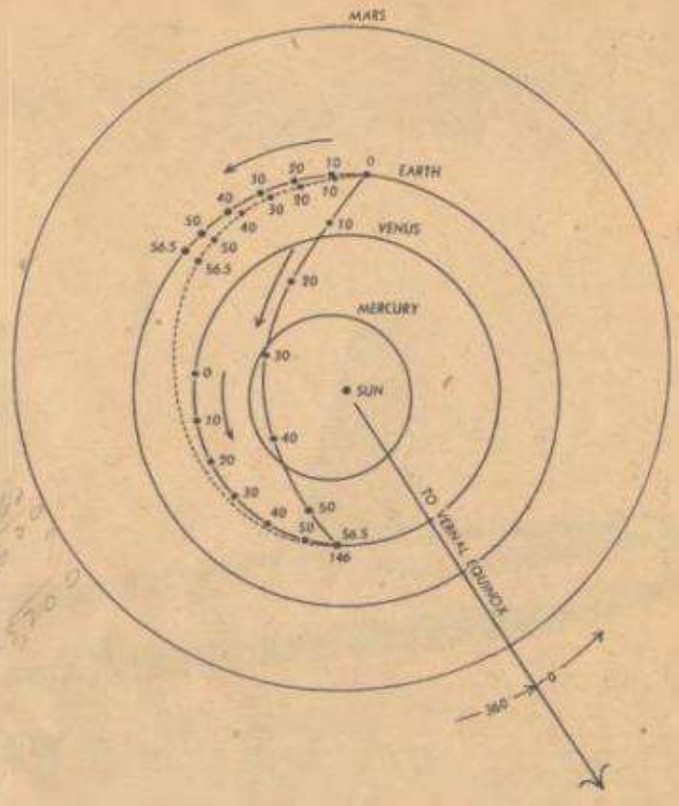


Fig. III. Similar comparisons of the two orbit-types for the Earth-to-Venus trip. In this case, the economy orbit—dotted—takes 146 days vs. 56.5 days for the faster hyperbolic orbit. Freight vs. passenger orbits?

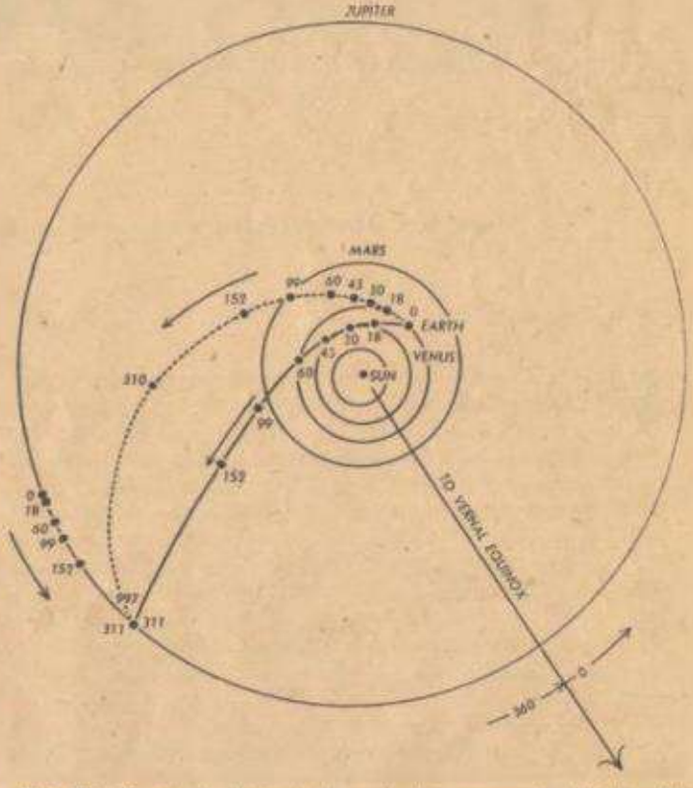


Fig. IV. The trip to Jupiter is long and slow, anyway you take it. But the hyperbolic orbit is 686 days—almost two years!—faster. Notice the small arc Jupiter covers in 331 days; Earth will have made nearly 11/12ths of a full circle. On the long route, Earth would make nearly two and three-quarters full circles around the Sun. Something a lot faster than any presently-known rocket type engine will be needed to make Jupiter trips popular! Hm-m-m- —and Pluto's seven times further out! And the stars . . .

These uniquely beautiful paintings of the planets, by Chesley Bonestelle, were prepared in collaboration with R. S. Richardson, of the Mt. Wilson Observatory staff, and represent the present latest knowledge and belief concerning the surface character of the planets.

Venus, always cloud-wrapped, naturally has been spy-proof; we can only infer what the surface is like. The spectroscope has shown no water vapor, and the best present estimate is that the clouds must be dust. Because the surface is hidden, we can't determine the length of Venus' "day" accurately, but it is estimated that the planet turns once in 20 to 30 days. The day side gets extremely hot; the night side gets enormously cold. The resultant tremendous difference in atmospheric temperatures sets up wind storms of unimaginable ferocity.

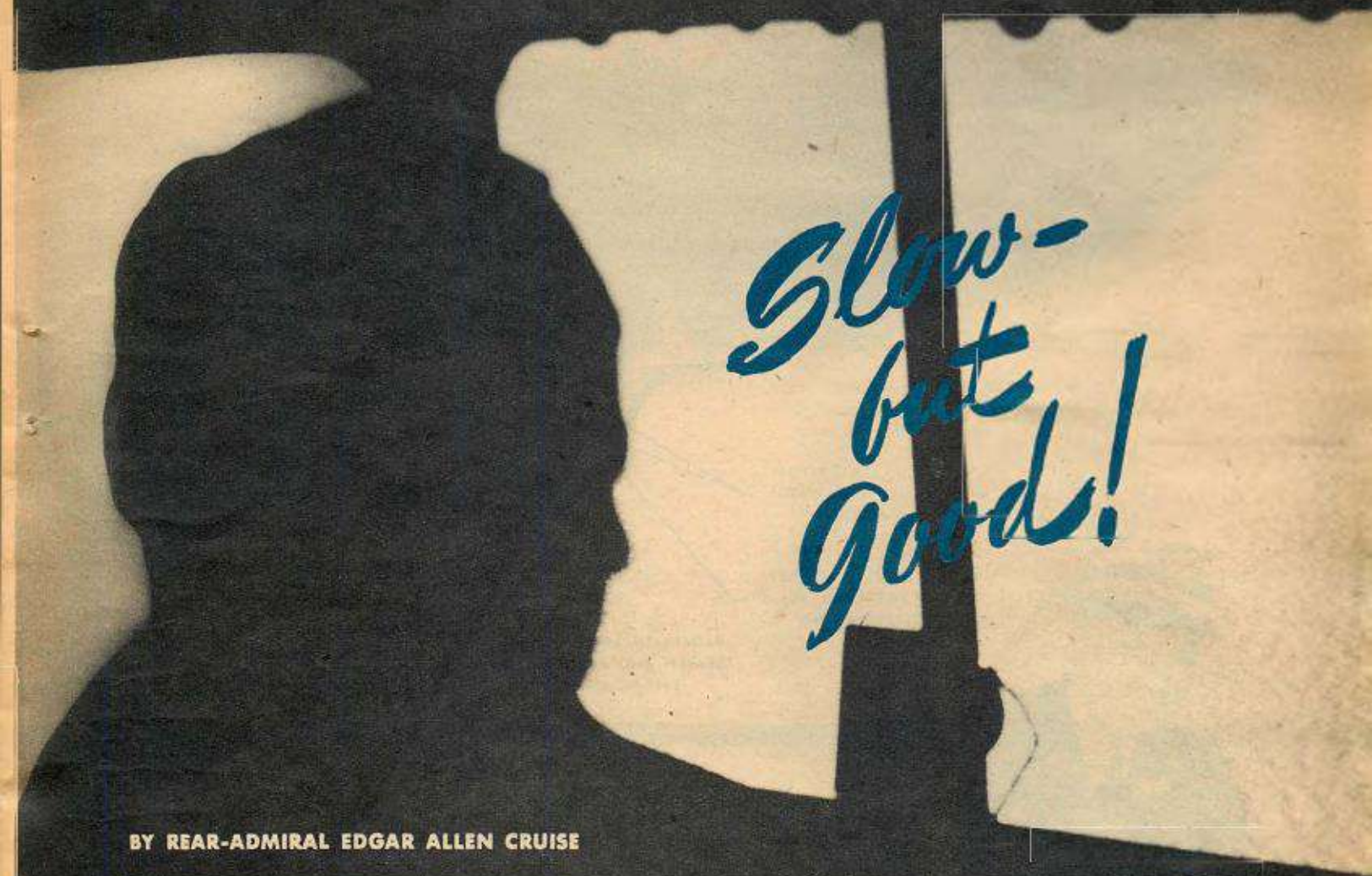
Jupiter, on our cover, is another cosmic mystery, veiled in cloud. Ten times the diameter of Earth or the Earth-size Venus, Jupiter is nearly four times as far from the Sun as Earth, and gets but a sixteenth as much light and heat. It's cold. Apparently, Jupiter consists of a solid, rocky core, covered by an immensely deep frozen ocean of ice, topped by oceans of half-frozen liquid ammonia gas. Finally, an atmosphere more than 12,000 miles deep presses down with hundreds of tons per square inch. But Jupiter, like Venus, is a violent planet. Stupendous cyclonic storms as big across as our whole planet scour through that incredible soupy atmosphere of free hydrogen and methane, heavily and noxiously tainted with ammonia. Apparently enormous volcanic violence is still at work; it's a Titan planet of titanic violence.

In strong contrast is the quiet beauty of the Martian landscape. Low, gently rounded hills in the foreground fall away to the blue streak of a marshy area below, and the broad, almost flat, meadowland beyond. In the distance is another marshy area, and another range of low, worn hills. From Earth's distance, this constitutes a "double canal." The blue water and green of the marshy meadowland, against the reddish, iron-oxide stained desert areas appear straight and narrow from 45,000,000 miles away.

Mars has the peace and quiet of a graveyard—for Mars is a nearly dead planet. Jupiter has the violence of a squalling baby—young and still forthing. Venus is dying now; it's a mature planet, like Earth, but fighting the drag of the too-near Sun's gravity—a grip that has already slowed its rotation almost as much as Earth has slowed the Moon's.

AIR TRAILS
JANUARY 1949

PROTECTOR OF OUR OCEAN LANES AGAINST MARAUDING SUBMARINES, THE BLIMP IS NOT DEAD IN THIS AGE OF SPEED. PLANS BY THE NAVY NOW CALL FOR BIGGER AND BETTER AIRSHIPS TO SAFEGUARD AMERICA'S SUPPLY LINES



Slow-but-Good!

BY REAR-ADMIRAL EDGAR ALLEN CRUISE

WHO wants to creep in a race against Mel Patton?

Who wants to fly at less than 100 miles per hour when planes are skirting and exceeding the speed of sound?

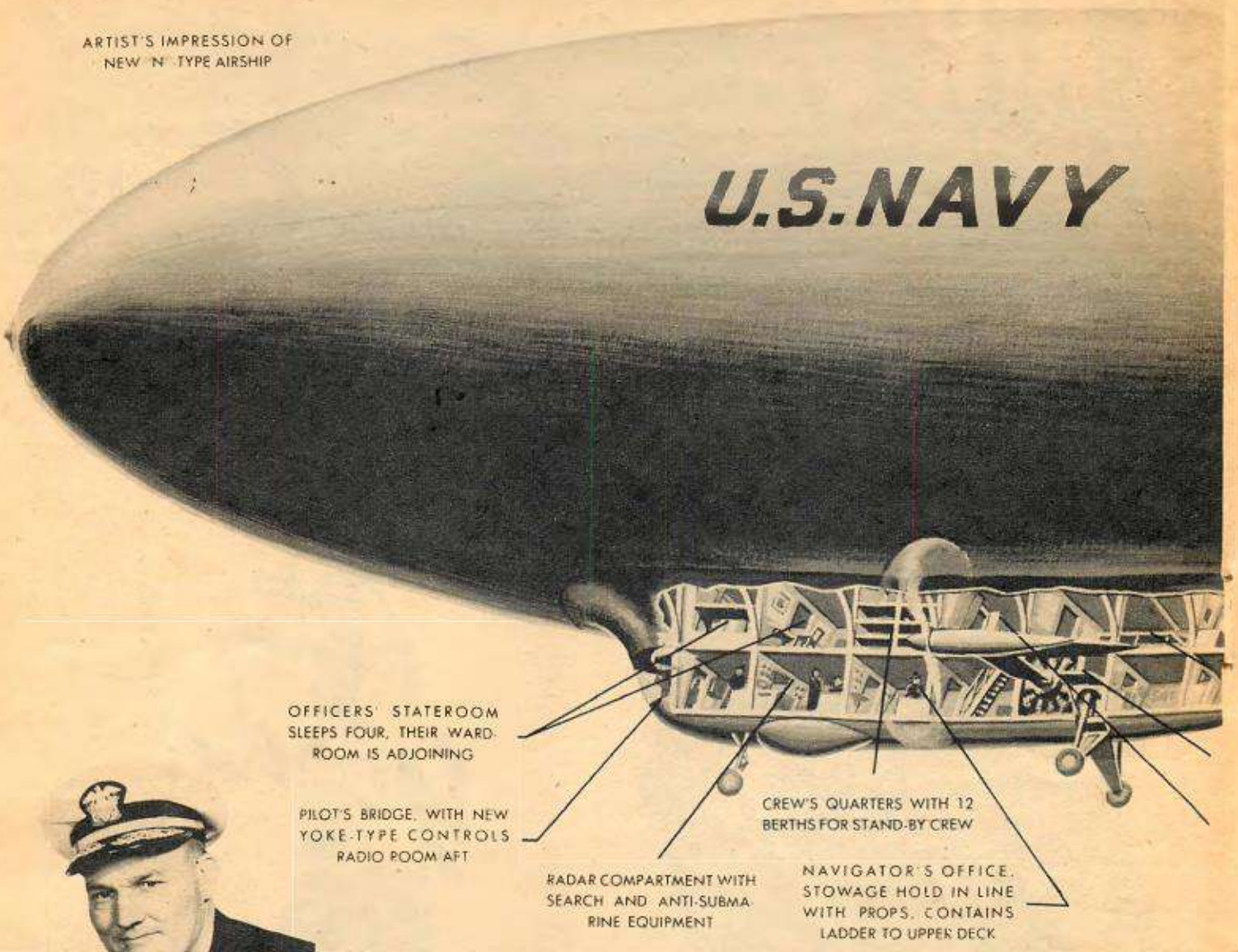
Who wants to? The United States Navy wants to. These questions came as the result of the Navy's recent announcement that a $1,500,000 contract had been awarded to the Goodyear Aircraft Company for the design and engineering of a new type of blimp. The proposed ship, designated by the Navy as the N-1, will be the largest non-rigid airship ever to be built. It will be almost twice as large as the K-type used by the Navy during World War II and will have about 100,000 cubic feet more envelope space than the M-type.

The editors of *Air Trails* have asked me why the Navy, in this day of speed—of turbojets, ramjets and rockets—wants to build a big, slow blimp.

The answer falls naturally into the "you can't tell the fire in the furnace by the snow on the roof" category. I asked before, "Who wants to creep in a race against Mel Patton, the Olympic speedster?" but I didn't say what kind of a race I had in mind. If the race were Patton's specialty, the 100 yard dash, there would be no question as to who would win. But if it were a race to see who could first find a collar button that had dropped under the wardrobe dresser, then Patton could charge around the room at his 9.3 clip as long as he wanted, but I would find the button, by merely a deep stoop, a crackling of the knee joints, and a quick and complete search with my eyes.

The analogy of course is far-fetched, but it serves my purpose. Speed, at times, can be a decided disadvantage. That's why the slow moving airship is highly desirable for certain types of jobs. Submarines are elusive and mighty hard to find and destroy. The new submarines are capable of making high speeds at great depths and have to a certain extent outmoded our past methods of combating them.

ARTIST'S IMPRESSION OF
NEW 'N' TYPE AIRSHIP



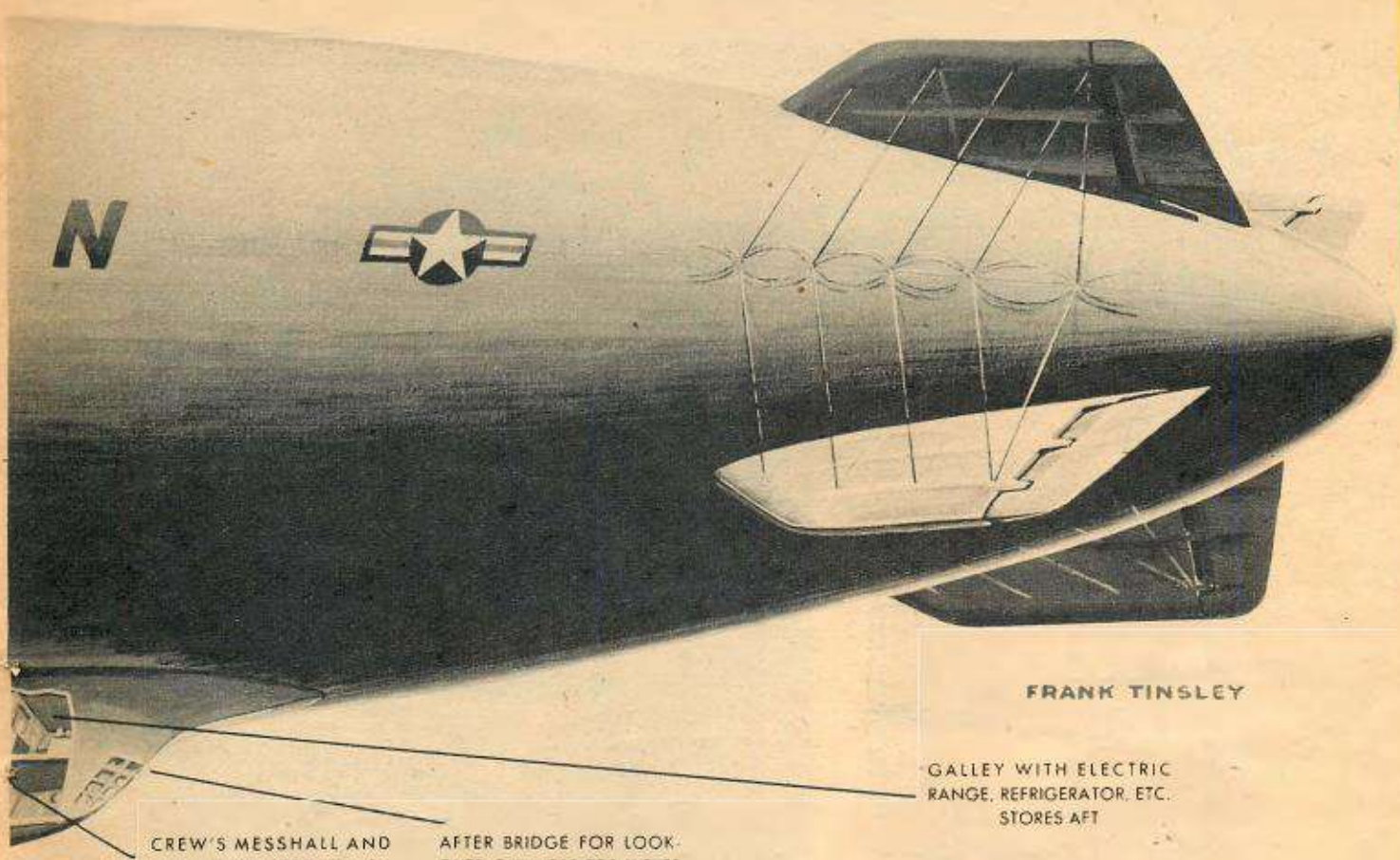
●Author, Rear-Admiral Edgar Allen Cruise, Chief, Air Readiness, Naval Operations, was Group Commander on Saratoga.

But with detection gear that has been vastly improved since VJ Day, plus new equipment, blimps have demonstrated in tests with our own submarines that they have a potential that must be duly considered in our anti-submarine plans.

The two chief objections that most heavier-than-air pilots have against the lighter-than-air blimps are that they are so big and so slow. These two objections are actually the two chief assets of the airship, and the size is so important that the Navy wants larger ones than the type in use today. The slowness of the over-sized silver footballs is advantageous in making a concentrated search of an area. When searching for a sub lurking 1,000 feet below the surface the area must be swept slowly so that the slightest signal is picked up.

The increased size proposed for the new blimps is to carry more and larger secret detection gear and to extend their range and endurance. In our tests, we have found that the airship is inherently well-suited for carrying and operating various types of newly perfected electronic devices. The large roomy control car (gondola) provides a stable platform which because of the distance from the engines is relatively free from vibration. At the present time, Captain George H. Mills, USN, Chief of Naval Airship Training and Experimentation and his staff at Lakehurst, New Jersey, have many high-priority projects underway for developing airship equipment and for improving the blimps. Among the latter are projects to find weight-saving envelope materials, better automatic pilots (old elevator wheel of airships is now doomed and is rapidly being replaced by yoke-controls), mechanical means of ground handling to eliminate the large number of men necessary to dock and undock the huge aircraft, and methods to refuel at sea.

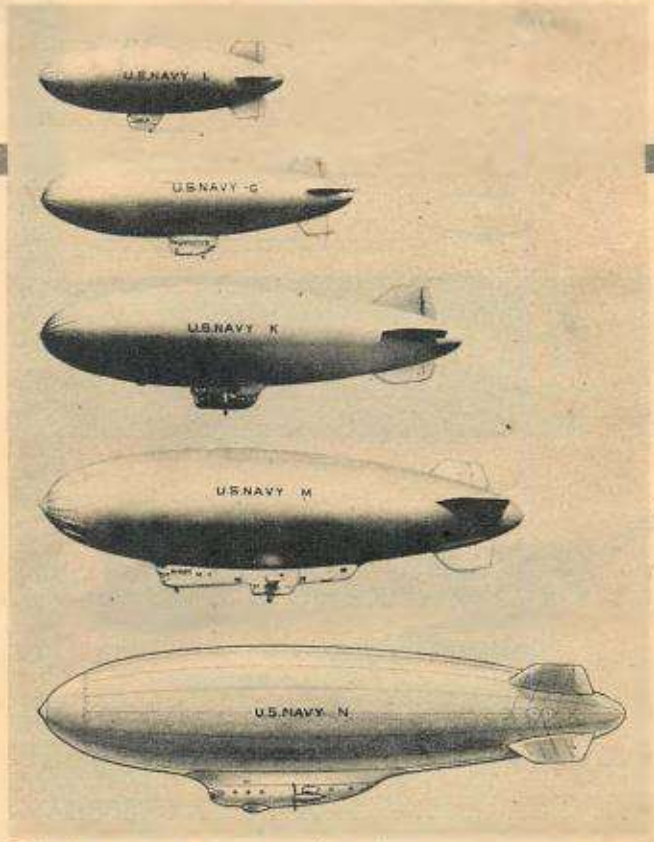
The results that the Naval Airship Training and Experimentation Command has obtained in their anti-submarine equipment projects are real eye-openers, and the Navy has given them the "go ahead."



The proposed airship, designated as the N-1, will be designed to provide more space and lift, longer range, and better sea-keeping and habitability features.

The "N" type envelope will be made of a new weight-saving material made of rayon coated with synthetic rubber which also will provide extra strength. The envelope, or bag as it is usually called, will be 324 feet long (M-type 302 ft., K-type 253 ft.) and 71 feet wide and will have a helium capacity of 825,000 cubic feet (M—725,000, K—456,000) and a gross lift of over 50,000 pounds.

The 87-foot control car will have two decks. The bottom deck will be the flight or operating deck and contain the control panels, radio and radar control posts, navigating post, flight engineer's compartment and look-out positions. The upper deck will be fitted out as living quarters for the crew. The car for the N-1 will have a modern galley and electric refrigerator to provide the crew with balanced diet on the cruises which are expected to last not for hours but for days and maybe weeks. The latter if the Lakehurst projects for refueling and provisioning at sea (*Turn to page 93*)



● "L," primary trainer, 150'; "G," advanced trainer, 190'; "K," sub patrol, 253'; "M," same as "K," 302'; new "N."

Flying Flattops

Aerial carriers are another solution for interception of fast long-range enemy A-bomb raiders

■ The shadow of the A-bomb bears heavily over American cities. . . Yet if we depend on the conventional radar-flak-plane setup to defend our major areas from a Red-A attack, it would take a force the size of the Normandy invasion to protect eleven of our most important cities, and that with only 40 to 50 percent effectiveness. Guided missiles, which appear to be our best bet from the standpoint of accuracy and economy, are at least three years in the future.

The place to stop the Red bombers headed for Detroit is over the Arctic Ocean, not over Lake Huron. This problem calls for a type of interception similar to an aircraft carrier, in locations and at conditions of speed and altitude where the carrier is out of its element. Thus the solution, for the time being, is to project aircraft carrier characteristics into the sky to meet the enemy more than halfway.

Experience with our B-36 bombers indicates that the current type of fighter suffers from certain disadvantages when attacking a bomber, and one of the best ways to restore its position of combat superiority and still permit it to be used against bombers a long way from the target, is the flattop in the sky.

For exploration of this idea, Vincent J. Burnelli "designed" an airplane, or rather a flying task force, that would be able to cope with the current problem. The Flying Flattop is a four-engined aircraft a little larger than the B-36, an adaptation of Burnelli's airfoil fuselage idea. It has a lifting body 80 ft. by 80 ft., with outboard wing panels bringing the span to a total of 250 ft. The plane is 120 ft. long and would be powered by four 10,000 hp gas turbines.

The front and sides of the airfoil fuselage would be devoted to crew facilities and to search radar. Because of its size and capacity, some five tons of radar equipment could be carried with radar antenna as large and accurate as those of any ground station.

Inside the fuselage, most of the area would be occupied by the hangar housing a full dozen Burnelli-type fighters embodying the same lifting fuselage characteristics and powered by two jet engines. To increase range, the fighters would be equipped with a telescoping wing system which allows a section of the wing to slide in and out, folding wings and tail booms to facilitate stowage.

Planes would be carried inside an overhead trolley system hung on a retractable hook. They would be launched and recovered through a trap-door forming a portion of the lower fuselage skin and sliding back like a Fowler flap. In the event of action, the first two fighters launched would act as protectors for the flattop, taking position above and below the mother ship, with the other ten going after the enemy. Their relative low wing loading would give them an advantage over the invading bombers. The flattop would have provision for in-flight refueling of the fighters, and as most refueling equipment is reversible, the carrier could take on fuel in flight, increasing the length of time for remaining out on patrol.

Burnelli also points out that such an aircraft would not become obsolete with the advent of guided missiles, as it represents an ideal platform for air launching of air-to-air or even air-to-ground missiles.

AIR TRAILS

Pictorial

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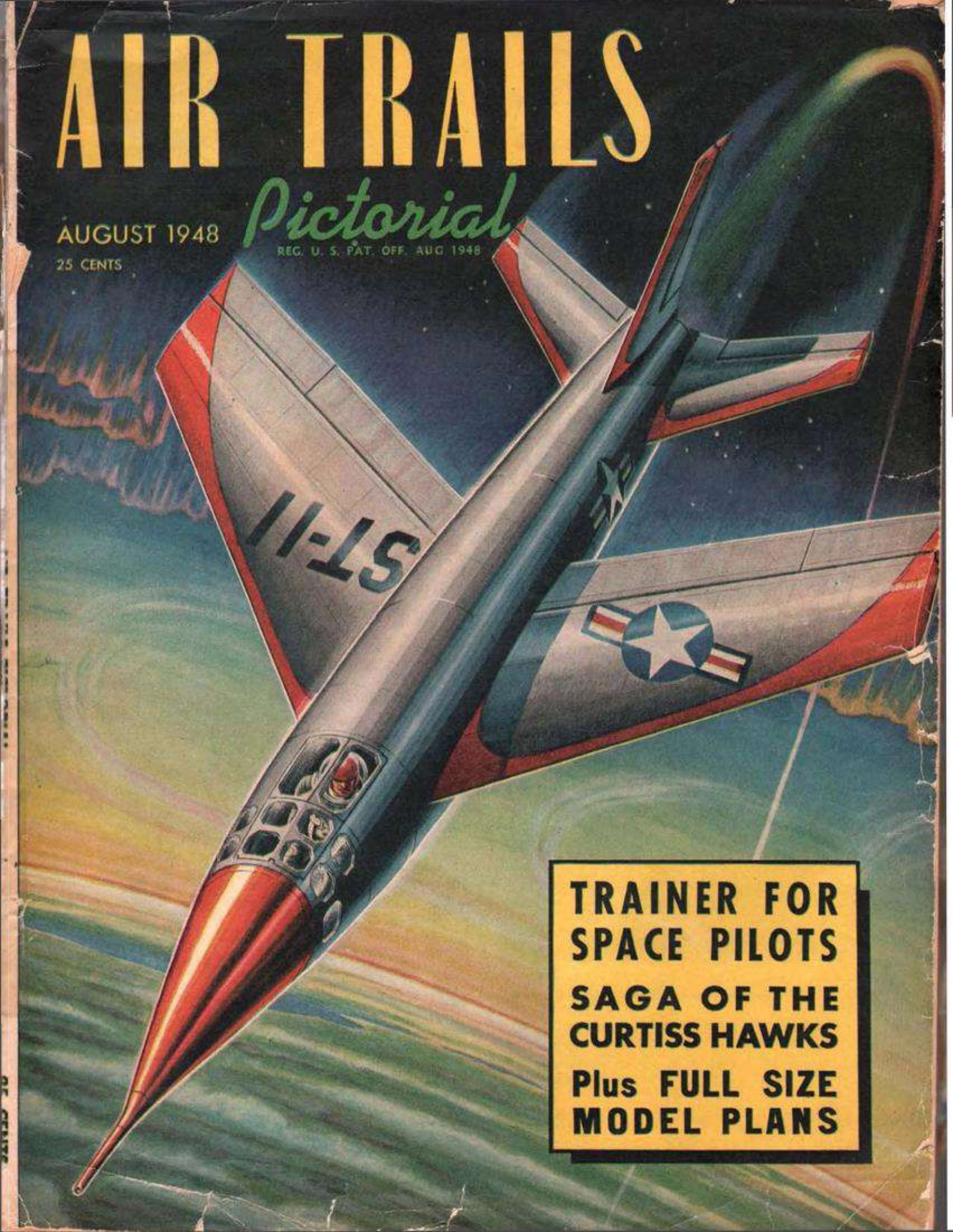

TRAINER FOR SPACE PILOTS

SAGA OF THE CURTISS HAWKS

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AIR TRAILS
AUGUST 1948

Space Trainer

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BY DAVID A. ANDERTON

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Behind him, and behind his first flight, will lie years of training and study. With him he will carry the end results of research and experimentation in metallurgy, chemistry, and aeroballistics, the countless flights of scale models, the ear-splitting roar of rocket motor tests, the reams of figure-covered papers and tables and forms, and days and nights of riveting and welding and tightening fittings.

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The problem of training a pilot raises an interesting question. Should we train a human being or build a robot? The idea of a human pilot, in these days of push-button ones, does seem rather stupid at first. Surely a box of wiring and tubes and motors can be built more easily, trained more cheaply, and be less affected by the rigors of an unknown flight than a human pilot. The robot is relatively impervious to heat and cold, high accelerations, lack of oxygen, low pressures, changes in visual acuity—all the things that the human body is not yet conditioned against. The robot can be fitted into an obscure corner of the structure, in a cramped space where there is no light or elbow room. It can be in one place, or in several, scattered all over the ship. It can literally be in many places at once: up in the nose, reading the instruments; back in the tail, watching the rocket flame for signs of poor combustion; out on the wing, gaging its deflections under load. These are good reasons for selecting a mechanical-electronic brain to pilot the first space ship.

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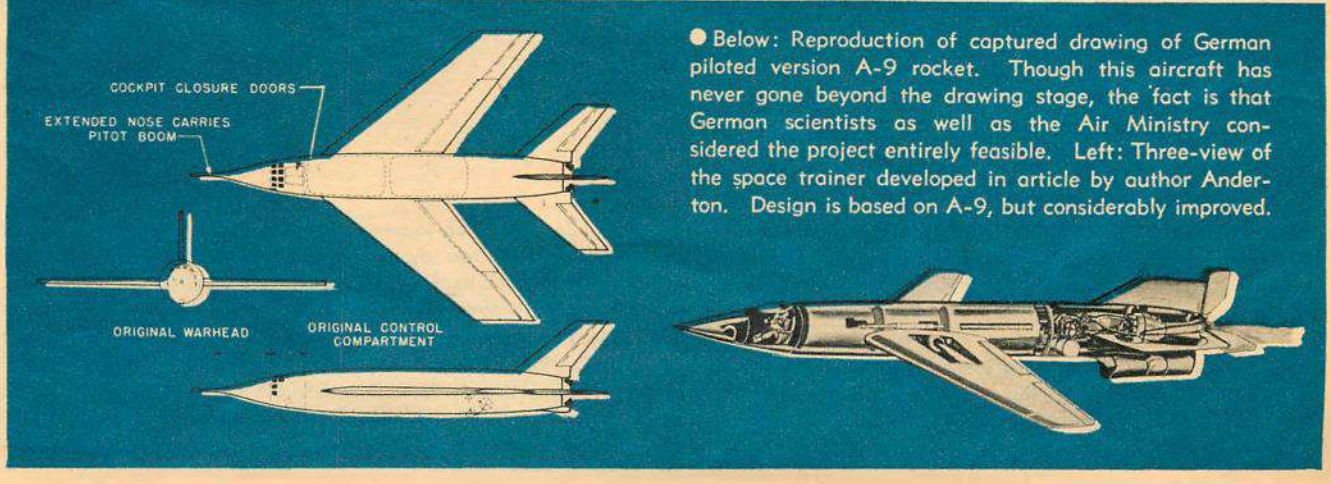

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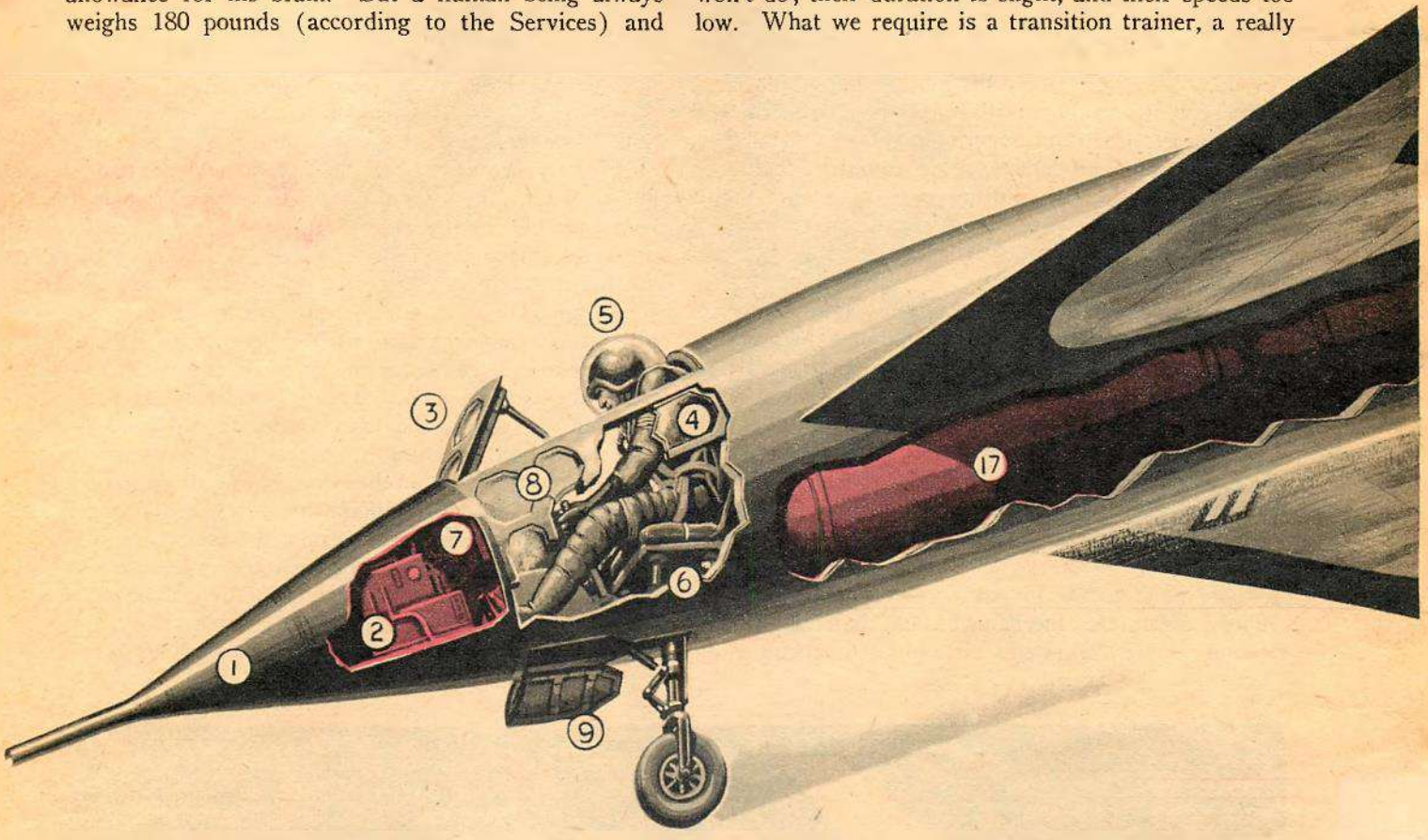

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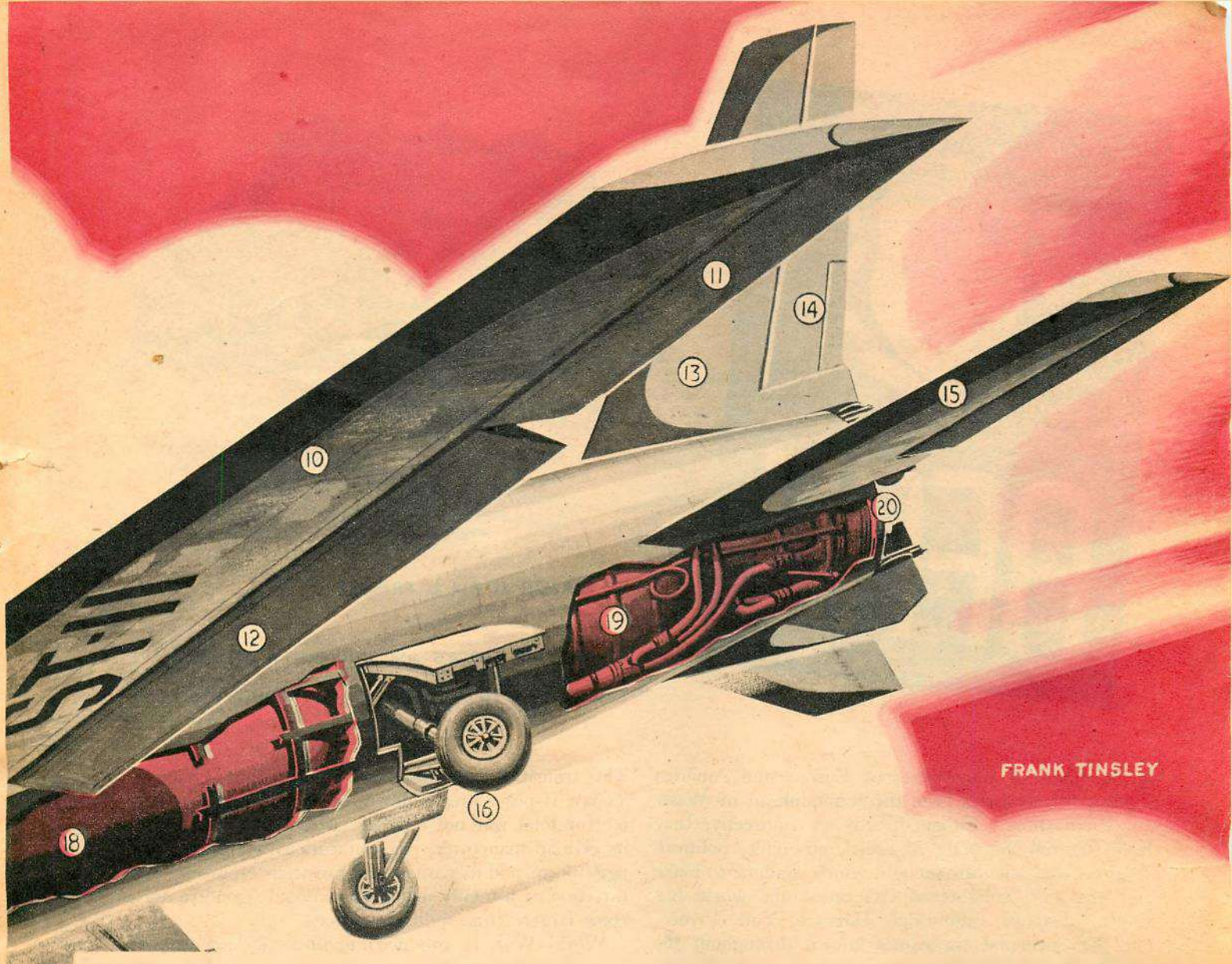

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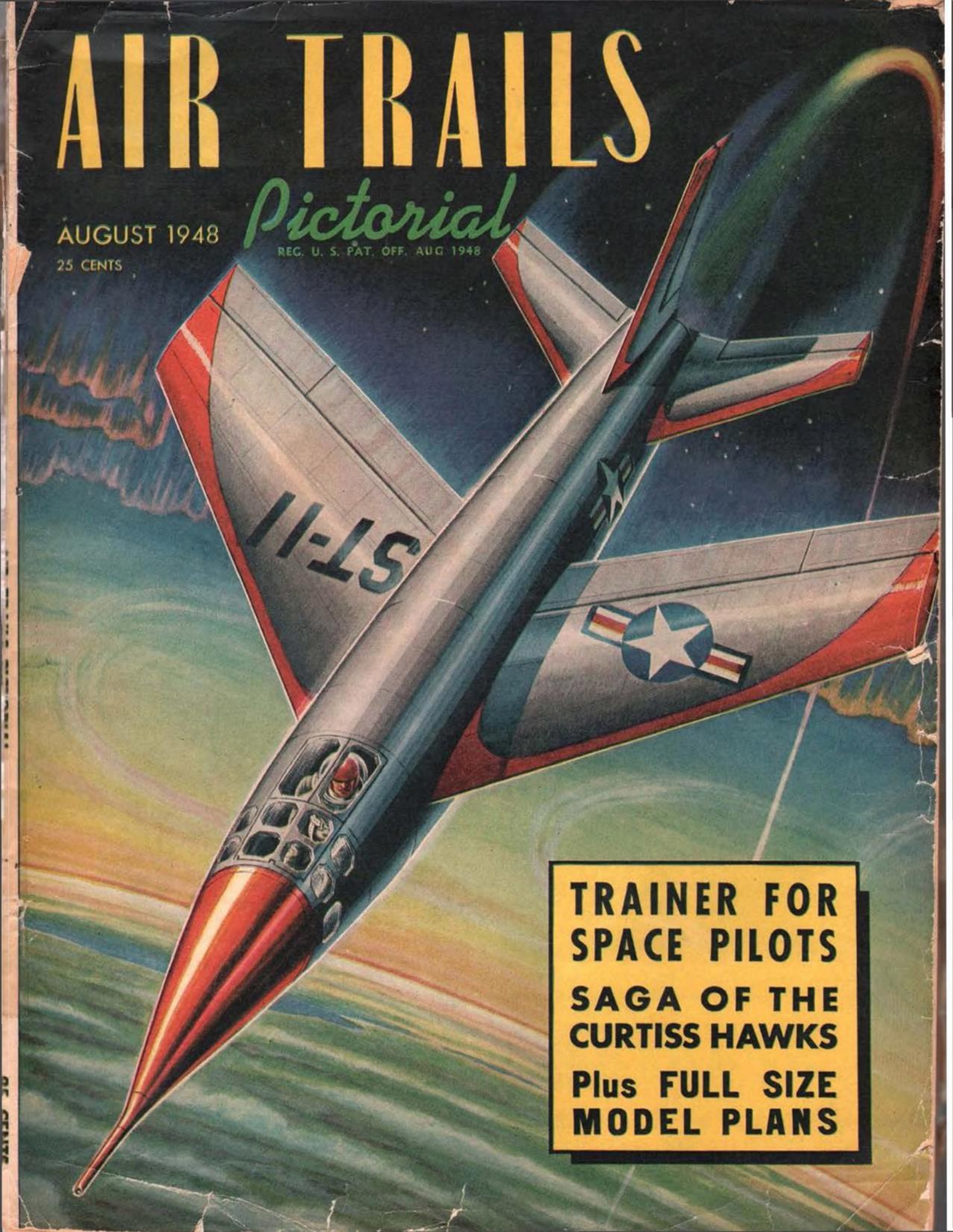

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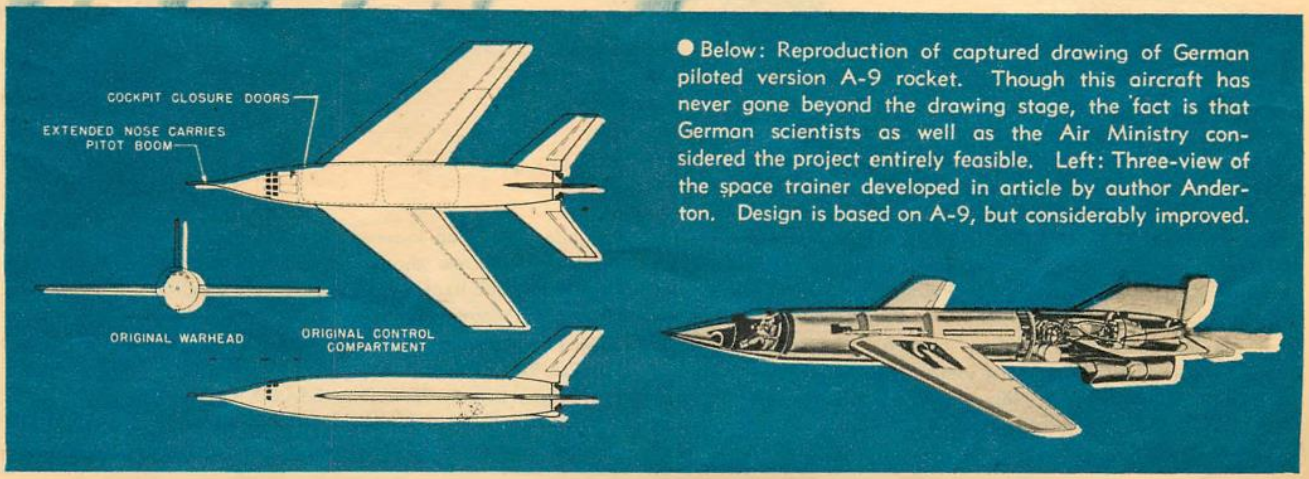

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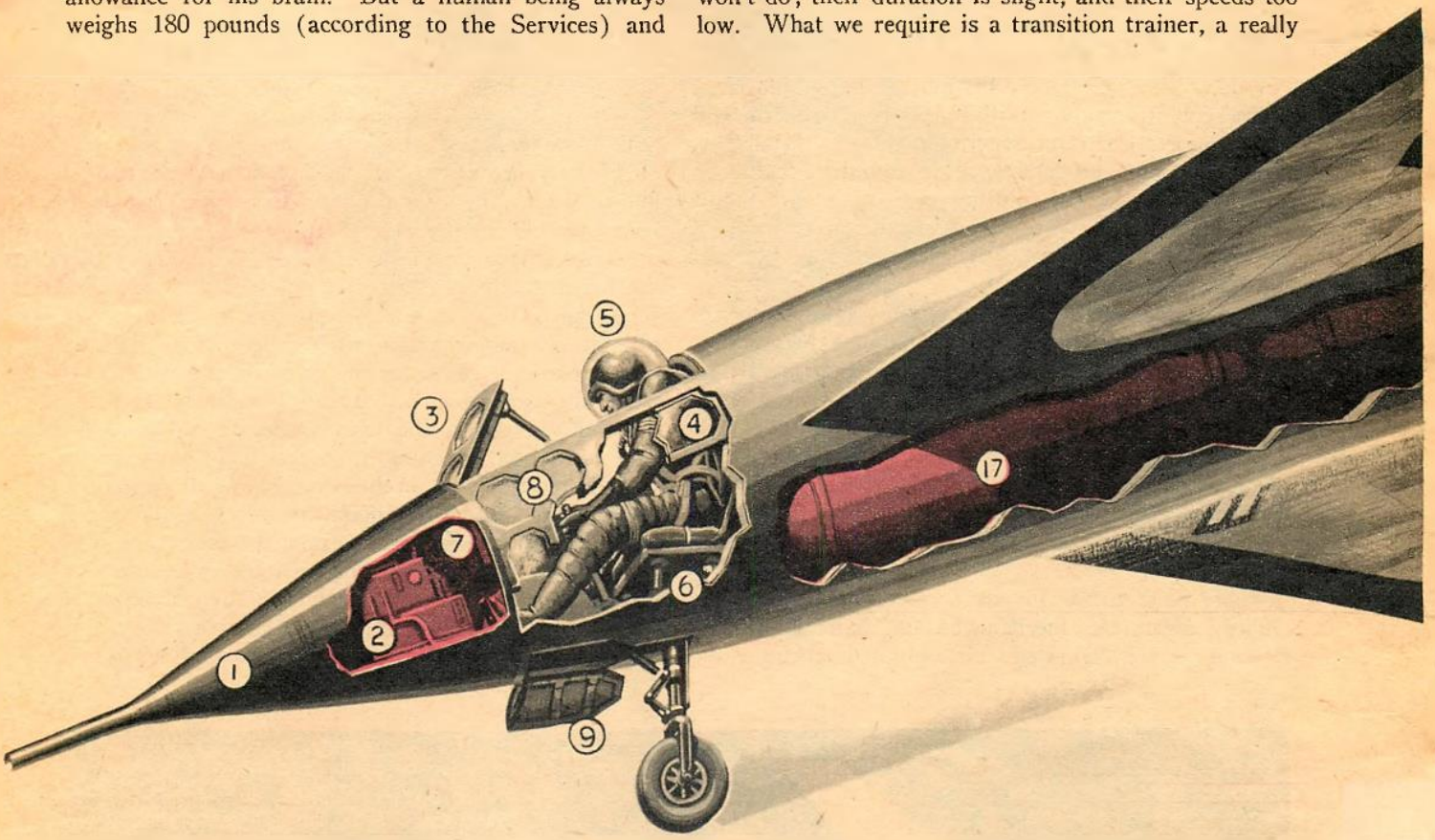

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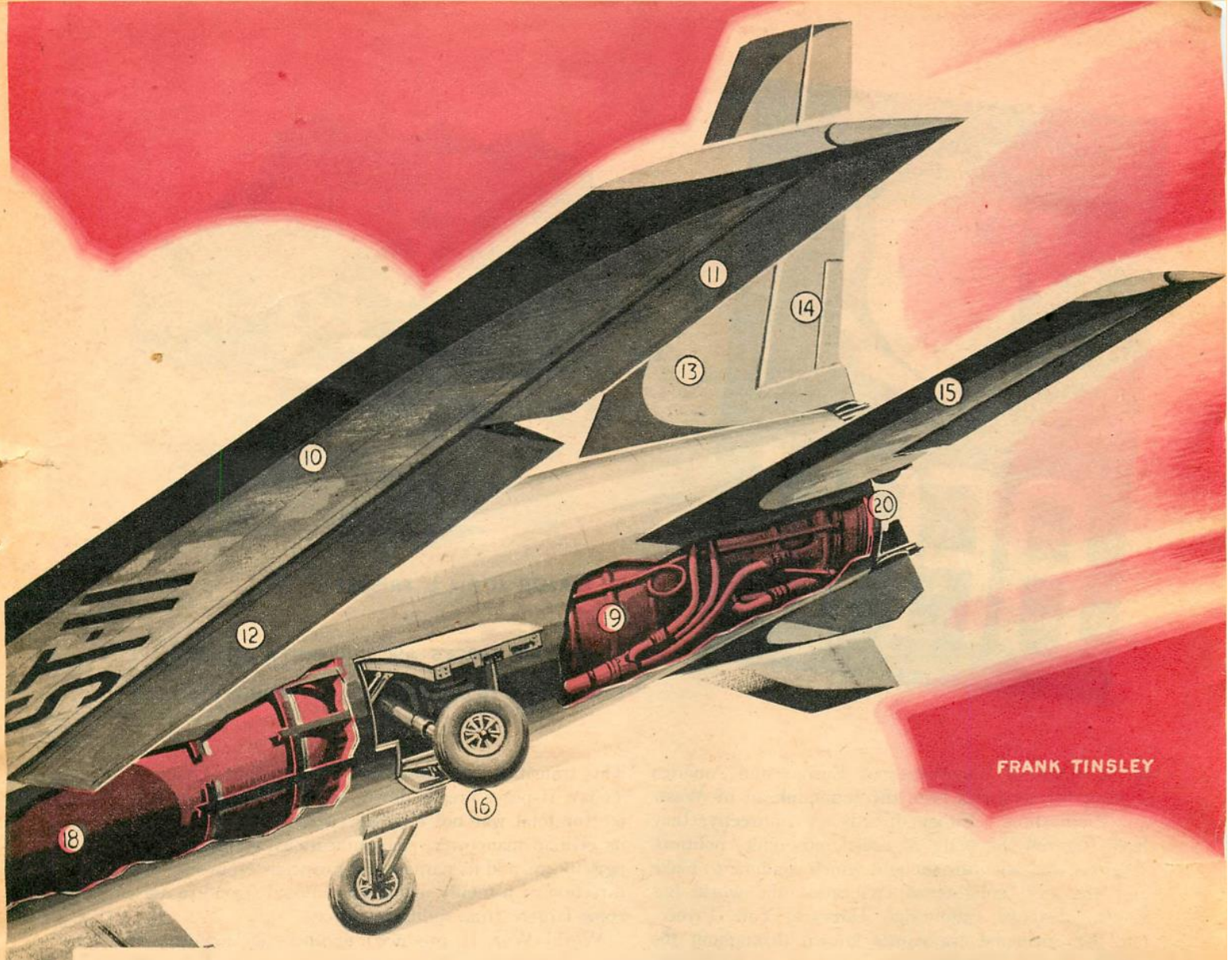

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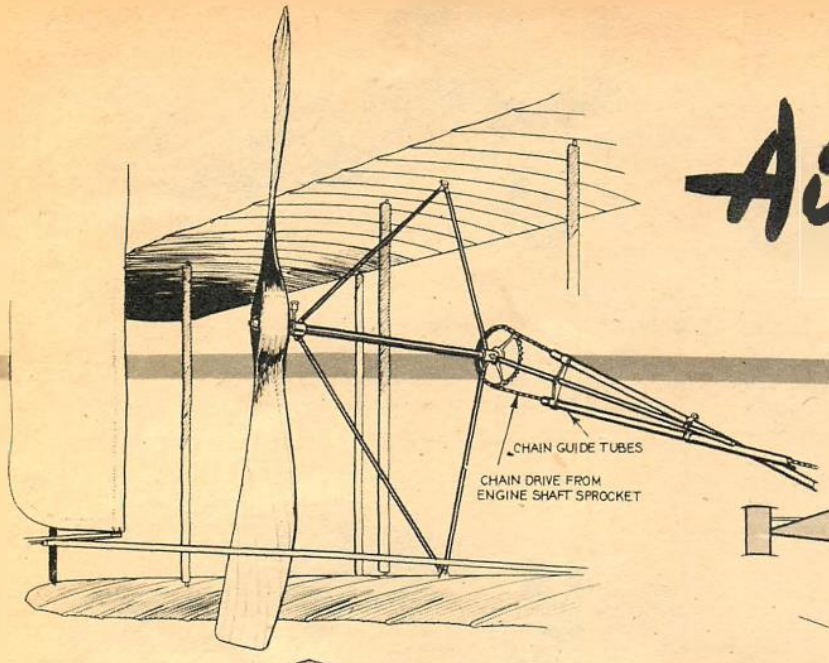
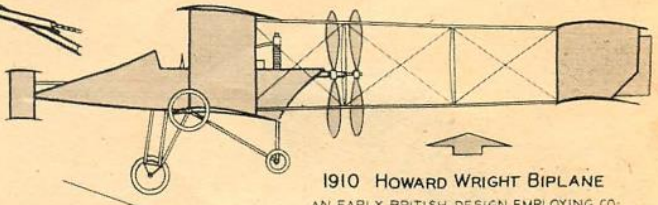
Air Progress



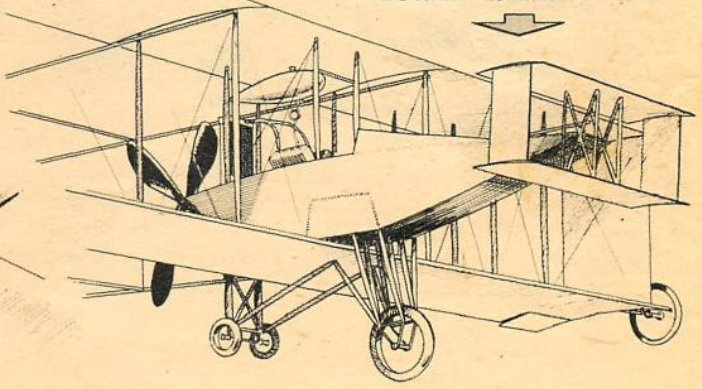
1903 WRIGHT BROS. BIPLANE

DETAIL OF PORT PROPELLER INSTALLATION SHOWING CROSSED CHAIN DRIVE EMPLOYED TO OBTAIN COUNTER-ROTATION. STARBOARD PROP HAD STRAIGHT CHAIN DRIVE



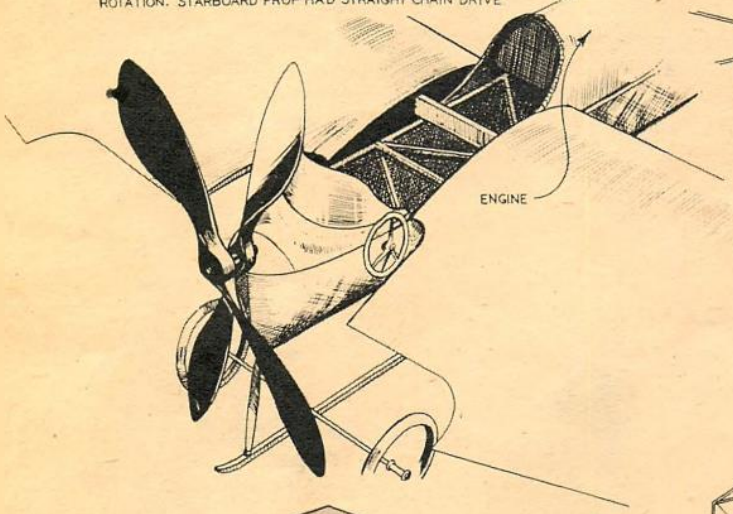
1910 HOWARD WRIGHT BIPLANE

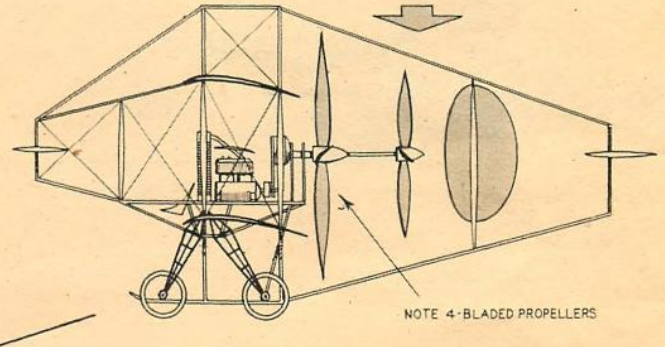
AN EARLY BRITISH DESIGN EMPLOYING CO-AXIAL CONTRA-ROTATING PROPELLERS.



1910 PIGGOT BIPLANE

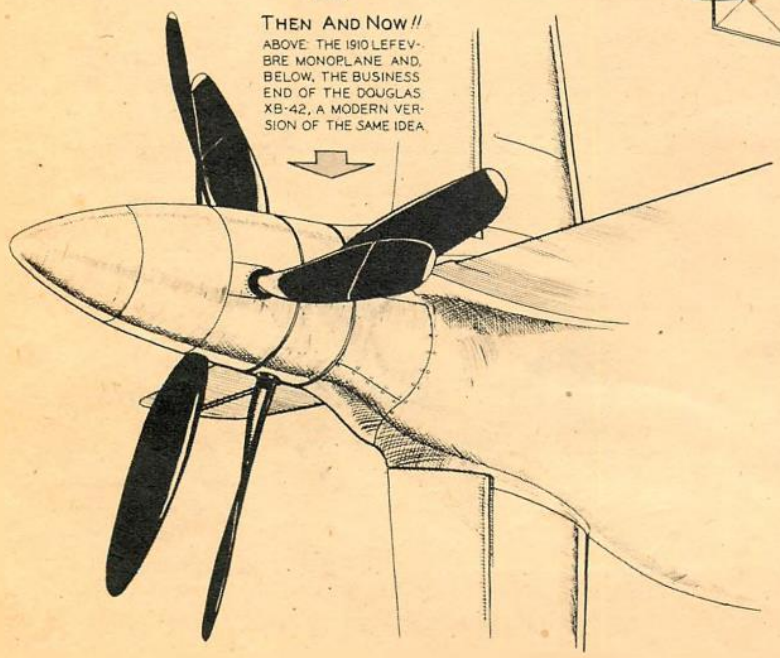
ANOTHER EARLY DESIGN FOR COAXIAL CONTRA-ROTATING PROPELLERS.





THEN AND NOW!!

ABOVE: THE 1910 LEFEVBRE MONOPLANE AND, BELOW, THE BUSINESS END OF THE DOUGLAS XB-42, A MODERN VERSION OF THE SAME IDEA

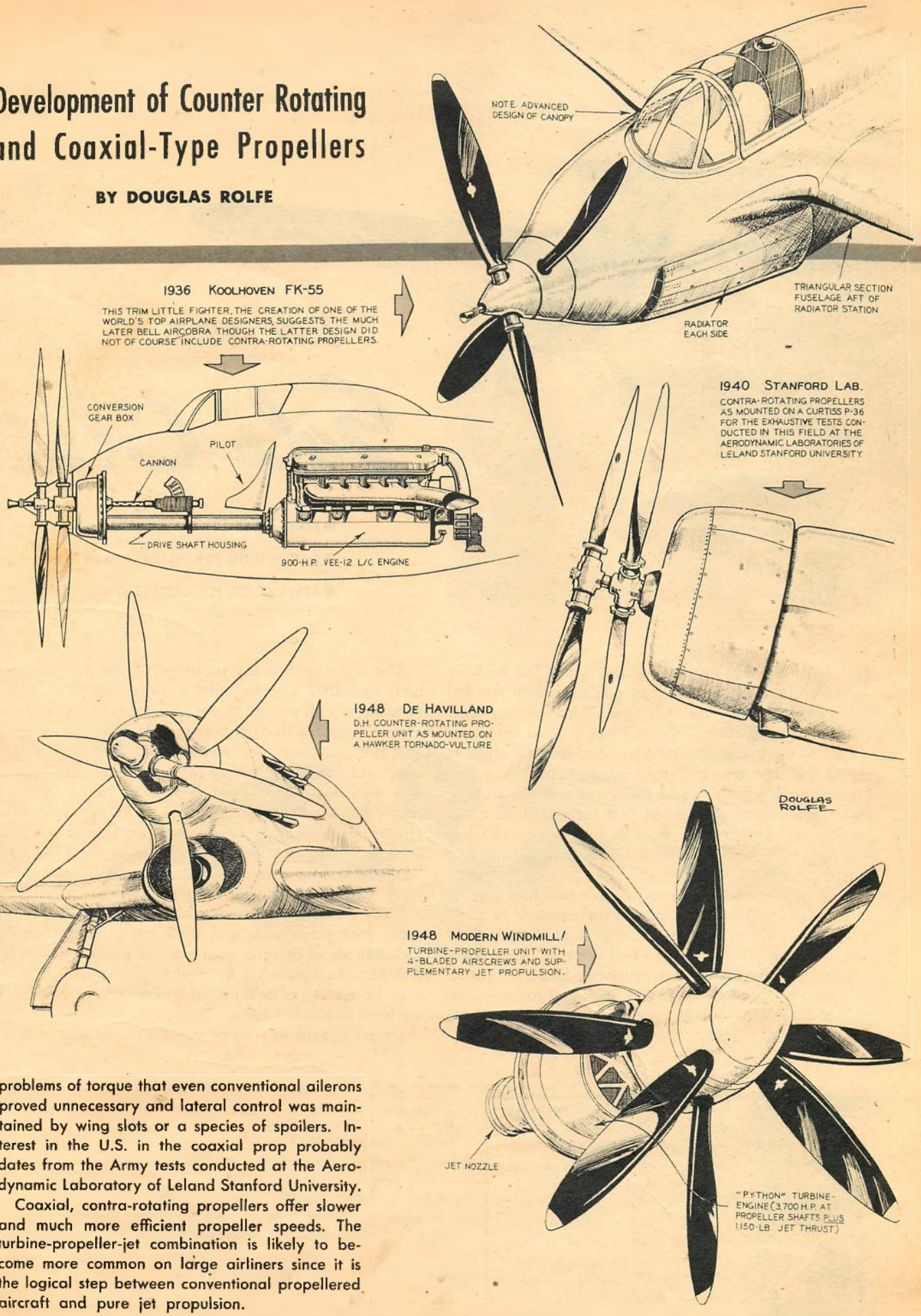


Strange as it may seem neither counter rotating nor coaxial propellers represent anything new in aviation design but were the subjects of close attention by even the earliest aeronautical designers. The Wright Brothers employed counter rotating (though not coaxial) propellers in the first successful heavier-than-air flight, and genuine co-axial propellers appeared as early as 1910.

First to revive the coaxial, contra-rotating prop in recent years was the brilliant Anglo-Dutch designer, Koolhoven. His remarkable little fighter, produced around 1936, was so little troubled with

Development of Counter Rotating and Coaxial-Type Propellers

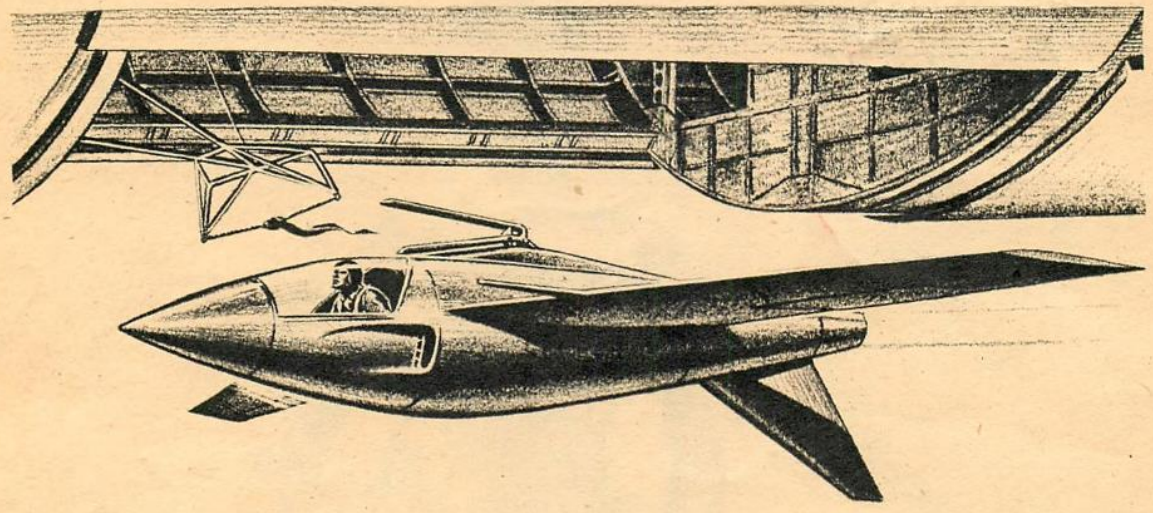
BY DOUGLAS ROLFE



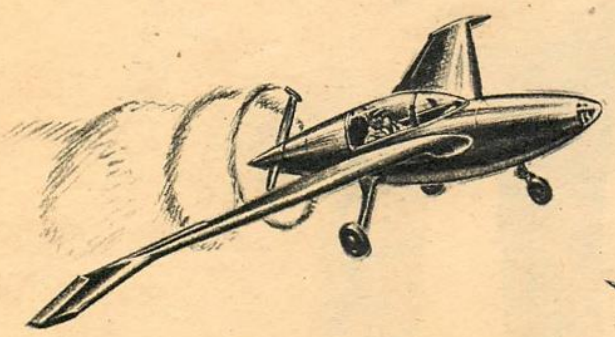
problems of torque that even conventional ailerons proved unnecessary and lateral control was maintained by wing slots or a species of spoilers. Interest in the U.S. in the coaxial prop probably dates from the Army tests conducted at the Aerodynamic Laboratory of Leland Stanford University.

Coaxial, contra-rotating propellers offer slower and much more efficient propeller speeds. The turbine-propeller-jet combination is likely to become more common on large airliners since it is the logical step between conventional propellered aircraft and pure jet propulsion.

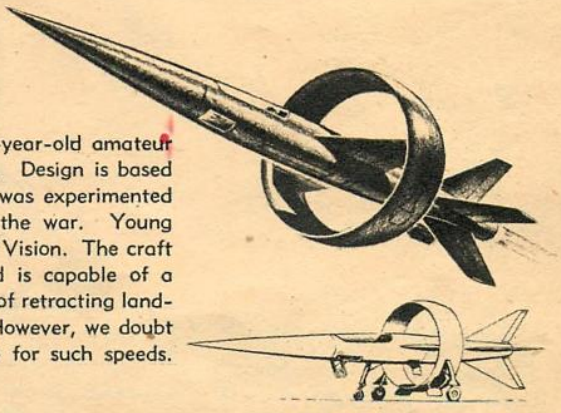
Airmen of Vision
DESIGN COMPETITION



● First place winner (an amateur entrant) is Don Longmire of Gardena, Calif., who came up with a parasite fighter, right on the heels of the Air Force announcement of the McDonnell XF-85. Longmire uses a flying-wing configuration with fuselage for the location of a ram-jet engine and prone pilot. Projected speed is 1000 mph. This is too optimistic and impractical, as the exceptionally high speed of the parasite will create considerable difficulty in recovering the plane by the mother ship. The ram-jet engine itself is not sufficiently flexible in operation to permit the fine throttling necessary for hooking on to the bomber. However, this very interesting design warrants consideration, and is in keeping with modern military trends.



● Designed by amateur Phil Graham of Arlington, Va., this flying wing airplane features a single bladed jet-prop. The jet unit constitutes the powerplant of the aircraft. Fuel into the jet is fed through hollow prop blade. This type of powerplant has been experimented with by the NACA and shows great promise, as it has all the advantages of propeller-driven craft without any of its problems, such as torque.



● Circular wing plane by 15-year-old amateur V. L. Modeland of Boone, Ia. Design is based on guided missile Roc which was experimented with by the services during the war. Young Modeland is a true Airman of Vision. The craft employs a rocket engine and is capable of a speed of 1000 mph. Method of retracting landing gear is quite ingenious. However, we doubt that circular wing is suitable for such speeds.

[See Rules on Page 84]

AIR TRAILS
JANUARY 1949

PROTECTOR OF OUR OCEAN LANES AGAINST MARAUDING SUBMARINES, THE BLIMP IS NOT DEAD IN THIS AGE OF SPEED. PLANS BY THE NAVY NOW CALL FOR BIGGER AND BETTER AIRSHIPS TO SAFEGUARD AMERICA'S SUPPLY LINES

Slow-but-Good!

BY REAR-ADMIRAL EDGAR ALLEN CRUISE

WHO wants to creep in a race against Mel Patton? Who wants to fly at less than 100 miles per hour when planes are skirting and exceeding the speed of sound?

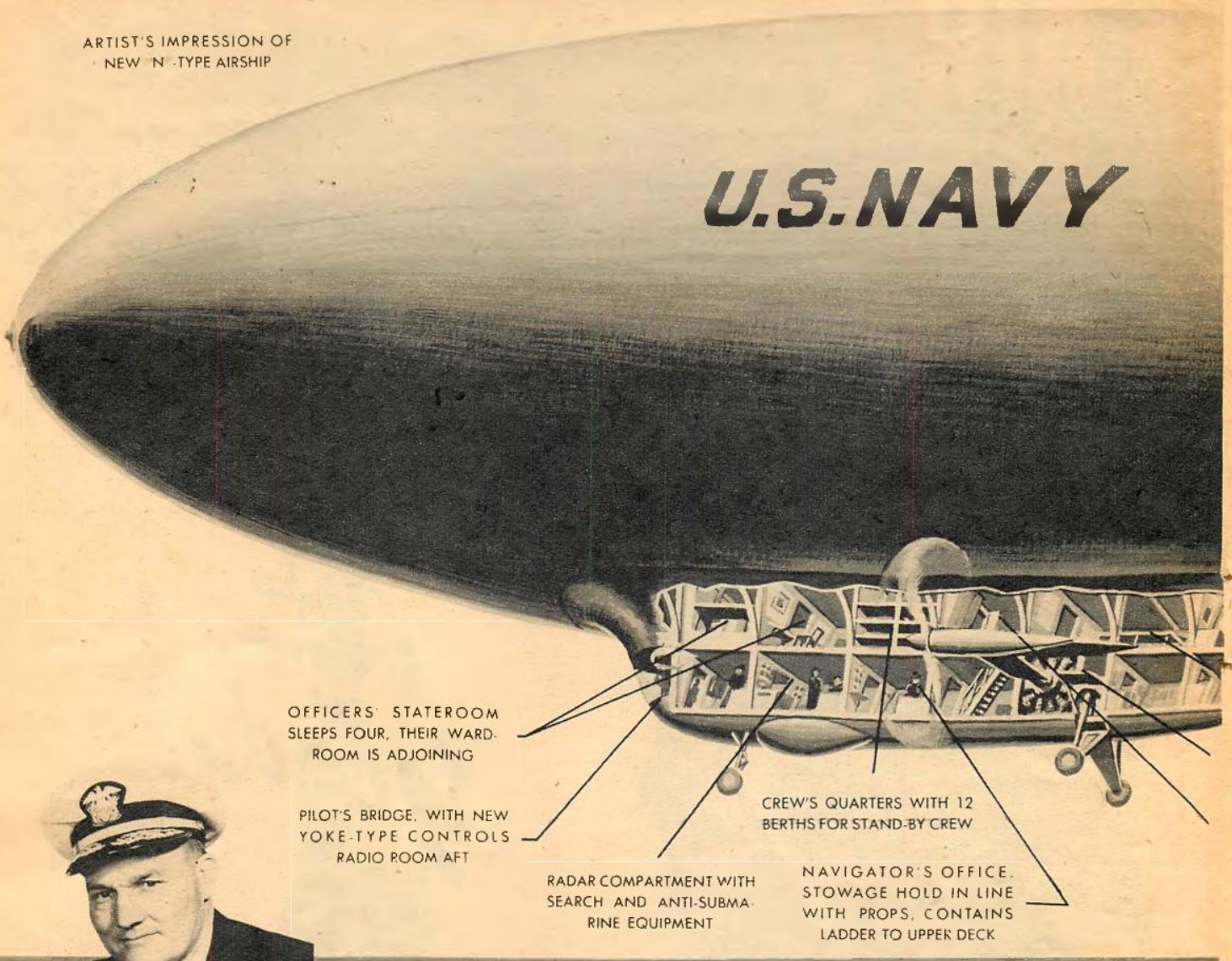
Who wants to? The United States Navy wants to. These questions came as the result of the Navy's recent announcement that a $1,500,000 contract had been awarded to the Goodyear Aircraft Company for the design and engineering of a new type of blimp. The proposed ship, designated by the Navy as the N-1, will be the largest non-rigid airship ever to be built. It will be almost twice as large as the K-type used by the Navy during World War II and will have about 100,000 cubic feet more envelope space than the M-type.

The editors of *Air Trails* have asked me why the Navy, in this day of speed—of turbojets, ramjets and rockets—wants to build a big, slow blimp.

The answer falls naturally into the "you can't tell the fire in the furnace by the snow on the roof" category. I asked before, "Who wants to creep in a race against Mel Patton, the Olympic speedster?" but I didn't say what kind of a race I had in mind. If the race were Patton's specialty, the 100 yard dash, there would be no question as to who would win. But if it were a race to see who could first find a collar button that had dropped under the wardrobe dresser, then Patton could charge around the room at his 9.3 clip as long as he wanted, but I would find the button, by merely a deep stoop, a crackling of the knee joints, and a quick and complete search with my eyes.

The analogy of course is far-fetched, but it serves my purpose. Speed, at times, can be a decided disadvantage. That's why the slow moving airship is highly desirable for certain types of jobs. Submarines are elusive and mighty hard to find and destroy. The new submarines are capable of making high speeds at great depths and have to a certain extent outmoded our past methods of combating them.

ARTIST'S IMPRESSION OF NEW 'N'-TYPE AIRSHIP



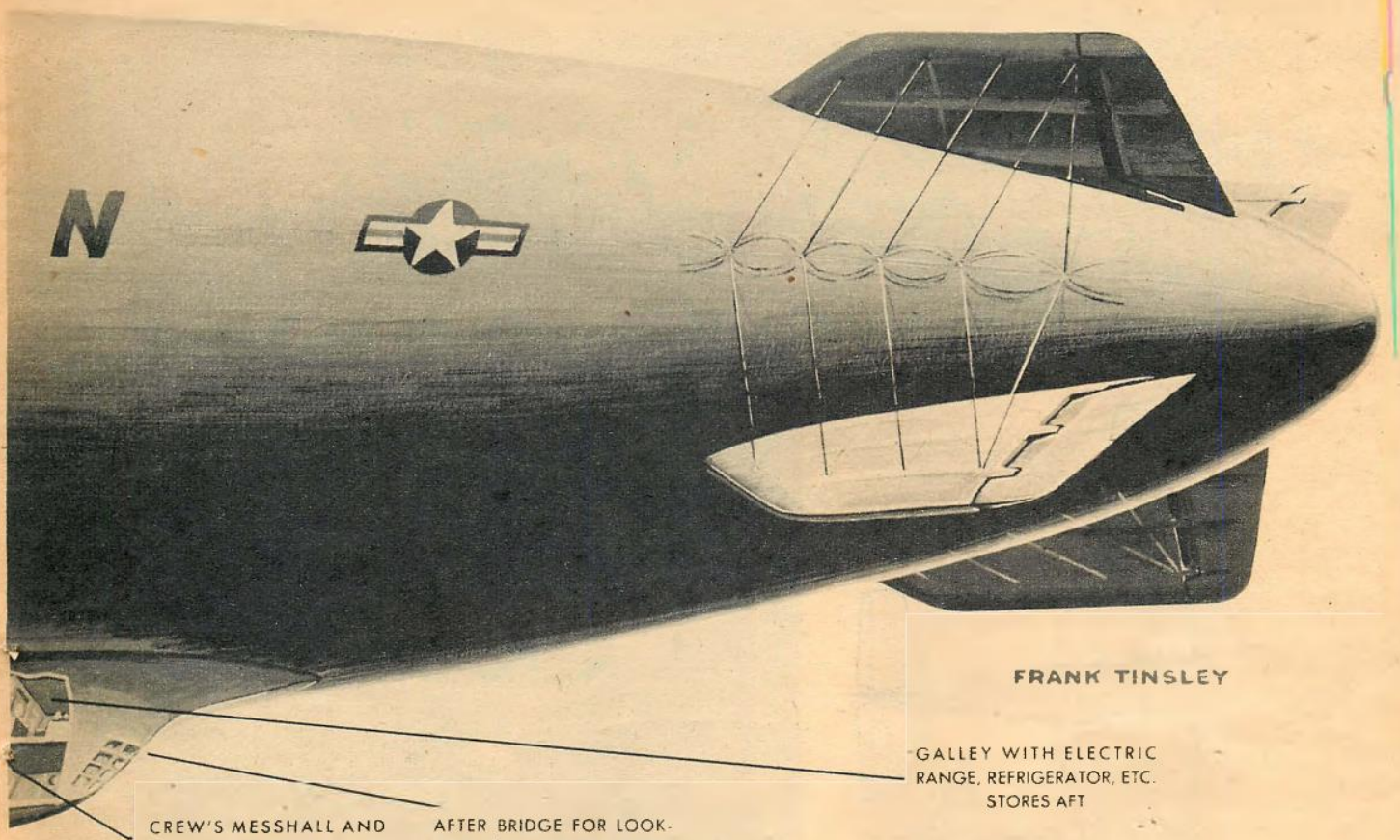
●Author, Rear-Admiral Edgar Allen Cruise, Chief, Air Readiness, Naval Operations, was Group Commander on Saratoga.

But with detection gear that has been vastly improved since VJ Day, plus new equipment, blimps have demonstrated in tests with our own submarines that they have a potential that must be duly considered in our anti-submarine plans.

The two chief objections that most heavier-than-air pilots have against the lighter-than-air blimps are that they are so big and so slow. These two objections are actually the two chief assets of the airship, and the size is so important that the Navy wants larger ones than the type in use today. The slowness of the oversized silver footballs is advantageous in making a concentrated search of an area. When searching for a sub lurking 1,000 feet below the surface the area must be swept slowly so that the slightest signal is picked up.

The increased size proposed for the new blimps is to carry more and larger secret detection gear and to extend their range and endurance. In our tests, we have found that the airship is inherently well-suited for carrying and operating various types of newly perfected electronic devices. The large roomy control car (gondola) provides a stable platform which because of the distance from the engines is relatively free from vibration. At the present time, Captain George H. Mills, USN, Chief of Naval Airship Training and Experimentation and his staff at Lakehurst, New Jersey, have many high-priority projects underway for developing airship equipment and for improving the blimps. Among the latter are projects to find weight-saving envelope materials, better automatic pilots (old elevator wheel of airships is now doomed and is rapidly being replaced by yoke-controls), mechanical means of ground handling to eliminate the large number of men necessary to dock and undock the huge aircraft, and methods to refuel at sea.

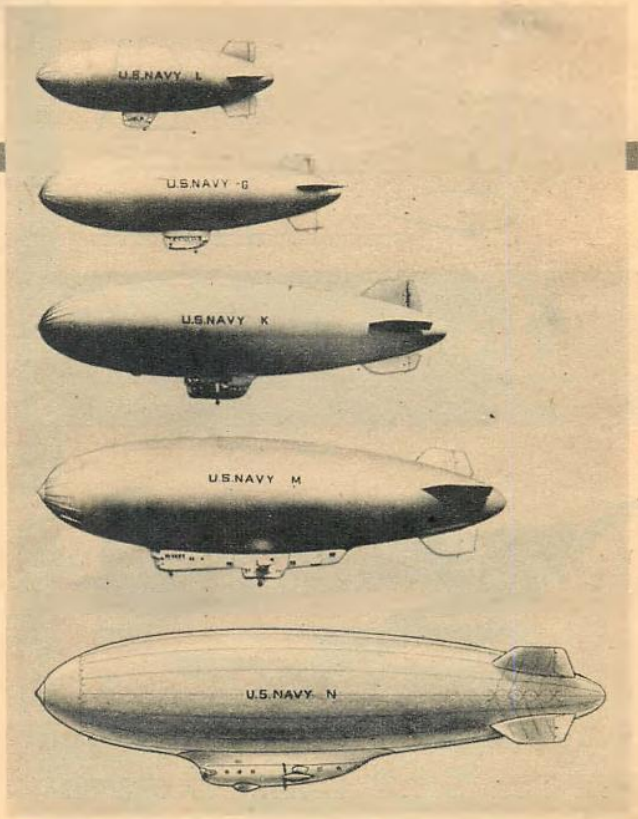
The results that the Naval Airship Training and Experimentation Command has obtained in their anti-submarine equipment projects are real eye-openers, and the Navy has given them the "go ahead."



The proposed airship, designated as the N-1, will be designed to provide more space and lift, longer range, and better sea-keeping and habitability features.

The "N" type envelope will be made of a new weight-saving material made of rayon coated with synthetic rubber which also will provide extra strength. The envelope, or bag as it is usually called, will be 324 feet long (M-type 302 ft., K-type 253 ft.) and 71 feet wide and will have a helium capacity of 825,000 cubic feet (M—725,000, K—456,000) and a gross lift of over 50,000 pounds.

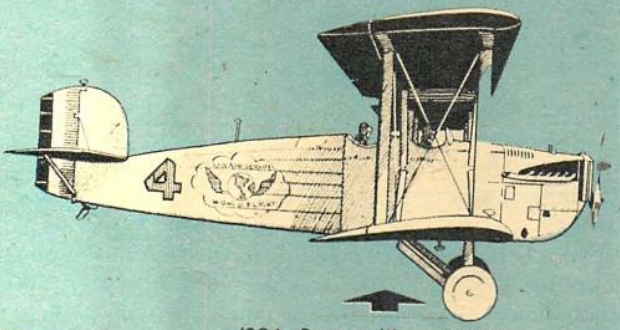
The 87-foot control car will have two decks. The bottom deck will be the flight or operating deck and contain the control panels, radio and radar control posts, navigating post, flight engineer's compartment and look-out positions. The upper deck will be fitted out as living quarters for the crew. The car for the N-1 will have a modern galley and electric refrigerator to provide the crew with balanced diet on the cruises which are expected to last not for hours but for days and maybe weeks. The latter if the Lakehurst projects for refueling and provisioning at sea (*Turn to page 93*)



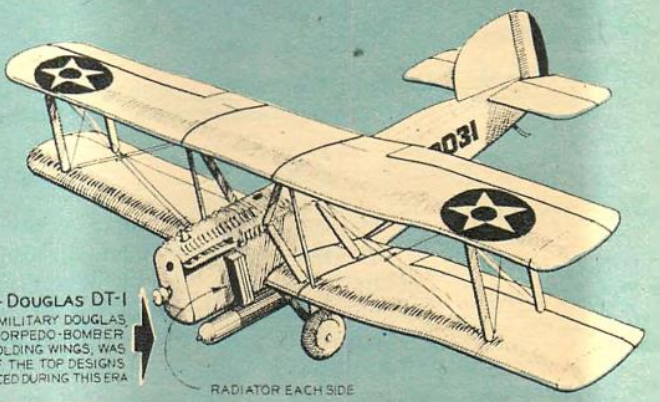
● "L," primary trainer, 150'; "G," advanced trainer, 190'; "K," sub patrol, 253'; "M," same as "K," 302'; new "N."

Air Progress

1920 – Douglas "Cloudster"
First Douglas design to appear. (400 H.P. Liberty, max. speed 120 MPH)

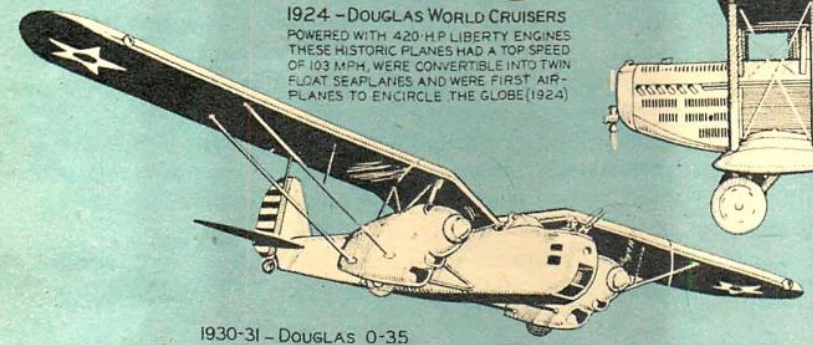


1924 – Douglas World Cruisers
Powered with 420-H.P. Liberty engines. These historic planes had a top speed of 103 MPH, were convertible into twin float seaplanes and were first airplanes to encircle the globe (1924)

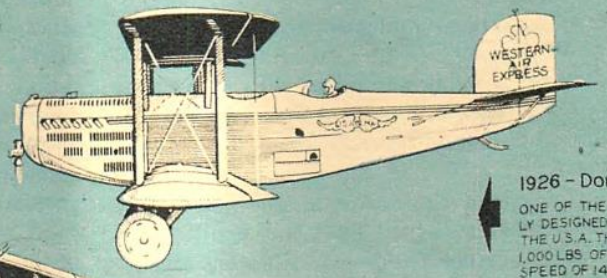


1921 – Douglas DT-1
First military Douglas. This torpedo-bomber had folding wings, was one of the top designs produced during this era

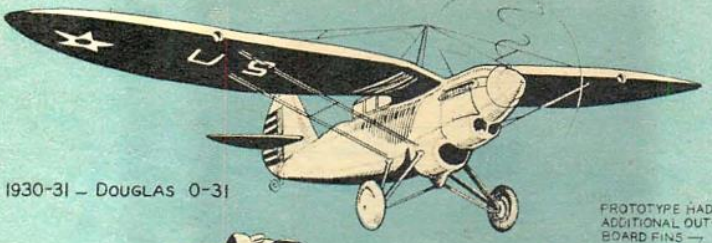
Radiator each side



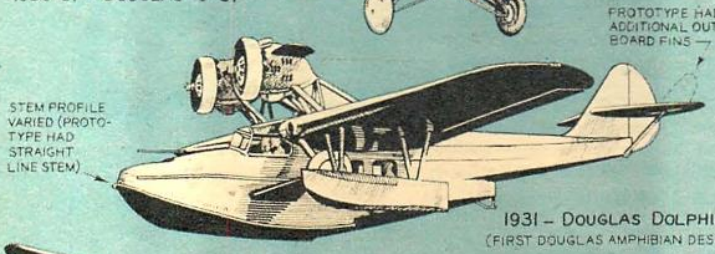
1930-31 – Douglas O-35



1926 – Douglas M-2
One of the first specially designed mail planes in the U.S.A. The M-2 carried 1,000 lbs. of mail at a top speed of 145 MPH, operating from coast to coast



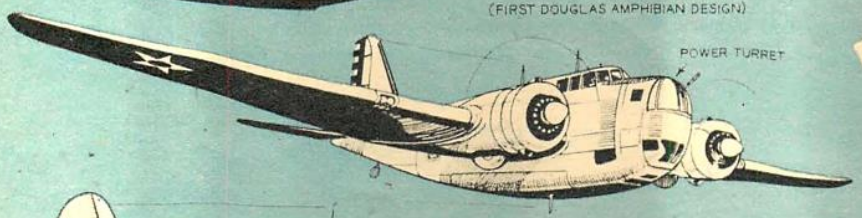
1930-31 – Douglas O-31



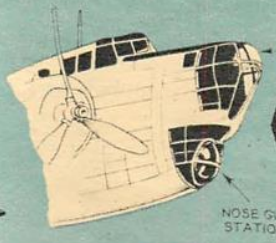
1931 – Douglas Dolphin
(First Douglas amphibian design)

Founded in 1919 by Donald Douglas, still head of the company, the vast Douglas plants have produced more commercial transports than any company in the world.

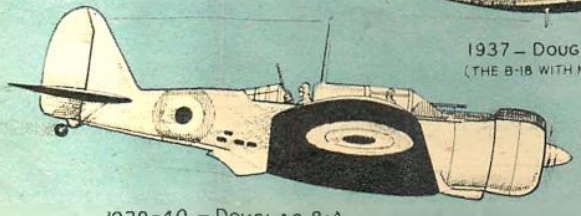
In 1921 Douglas won a Navy torpedo-plane contract with their first military design, the Douglas DT shown here. Between 1937 and 1941 the company was engaged, in addition to other activities, in designing and building the B-19 bomber (not illustrated) whose 212-foot wing span and 18-ton bomb load capacity set the pattern for all big bombers produced since.



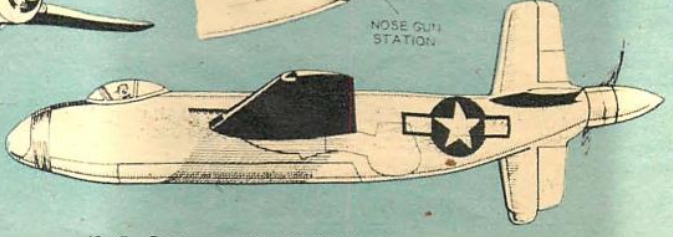
1937 – Douglas B-18A
(The B-18 with modified nose)



1936 – B-18 Nose Detail
The Douglas B-18 bombers were developed from the famed DC-2 transport.



1939-40 – Douglas 8-A
(Export model attack bomber)



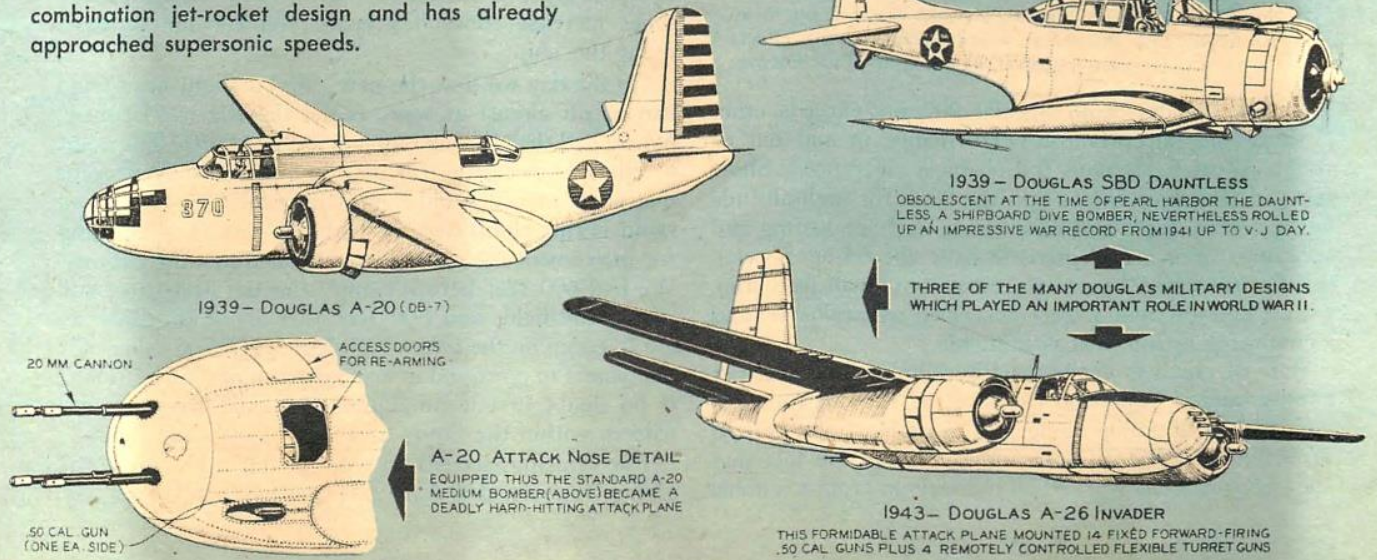
1945 – Douglas XB-42 "Mixmaster"

THE DOUGLAS STORY

BY DOUGLAS ROLFE

During the last war Douglas fighters and bombers fought in every theater. More than 11,000 military versions of the DC-3 (C-47) were built for use as troop or cargo carriers. The latest Douglas military piston-engined design, the AD-1 Skyraider (not shown), a carrier-based attack plane, is one of the world's fastest planes.

Douglas was one of the first U.S. firms to enter the jet field and set new speed records with their D-558 Skystreak. Their latest, the Skyrocket, is a combination jet-rocket design and has already approached supersonic speeds.



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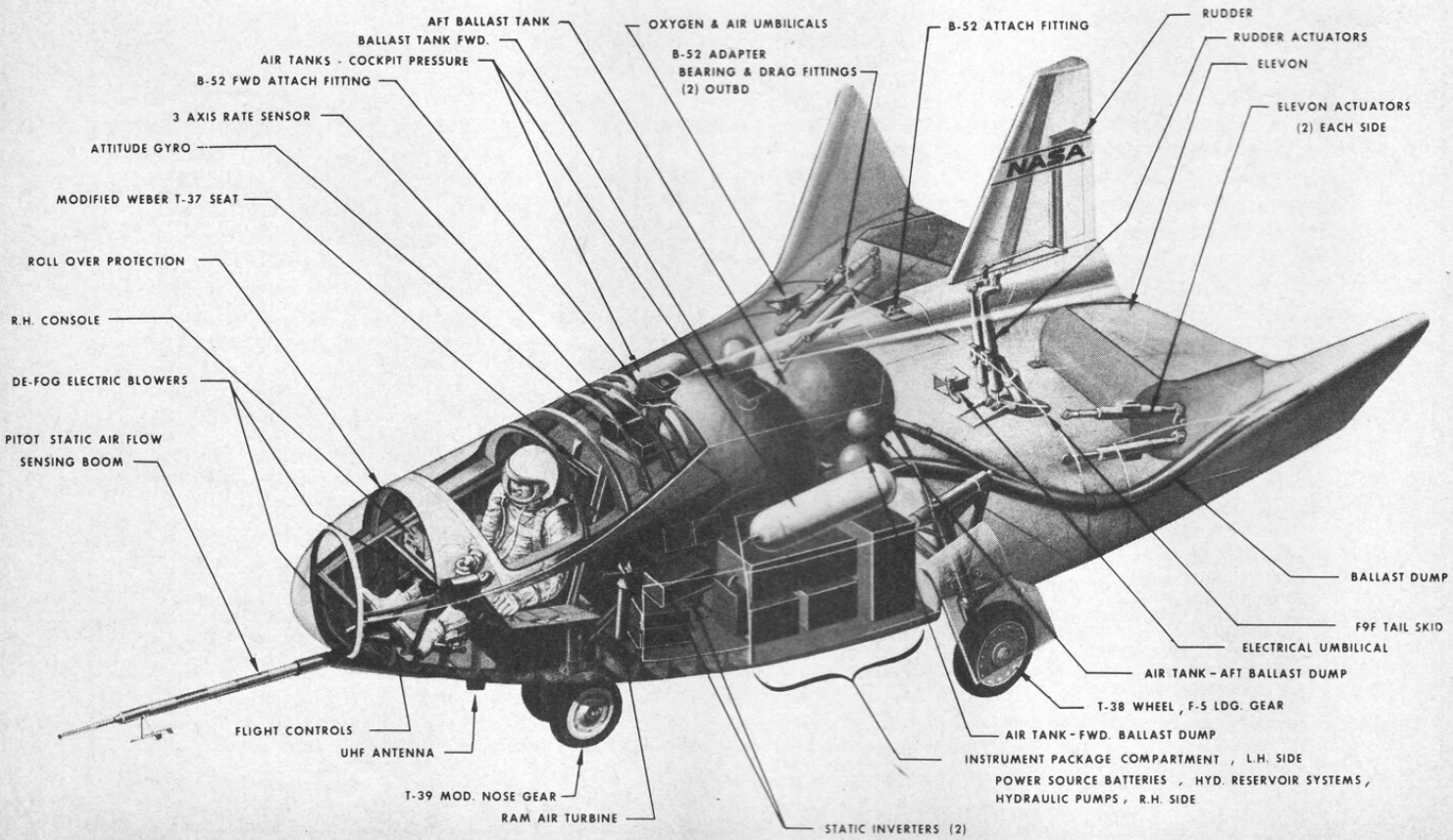
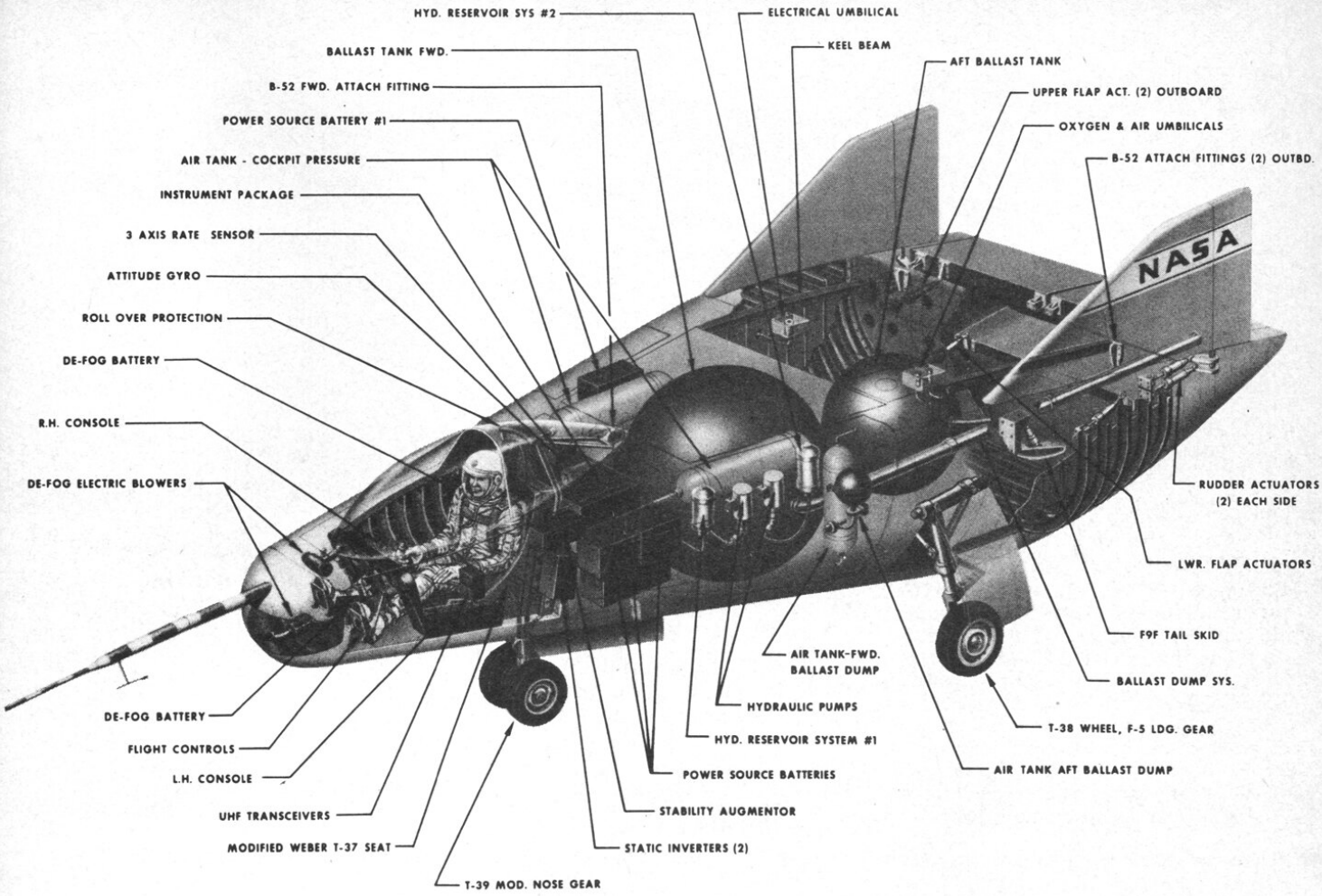
HL-10 LIFTING BODY RESEARCH CRAFT

Lifting Body Research Vehicles

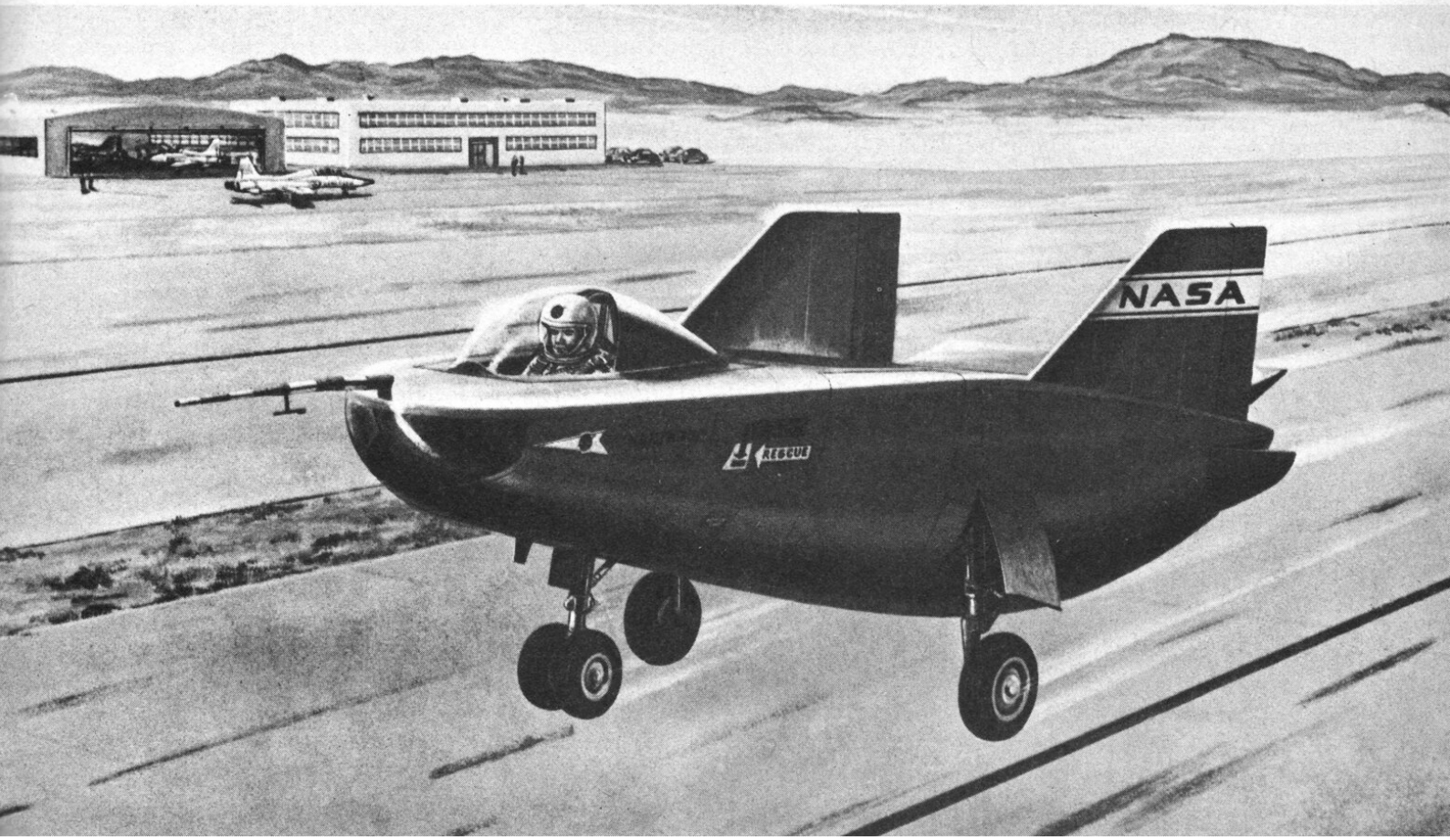
How NASA's HL-10 maneuverable aerospace vehicle will be dropped during tests from a B-52 mother ship is depicted here by a Northrop Corp. artist. Both the HL-10 on this page, a NASA Langley configuration, and the M-2 (opposite page) designed by Northrop, are being fabricated at Hawthorne, Calif., by Northrop.

NASA DESIGNED, NORTHROP BUILT, HL-10





NORTHROP DESIGNED, NORTHROP BUILT M-2



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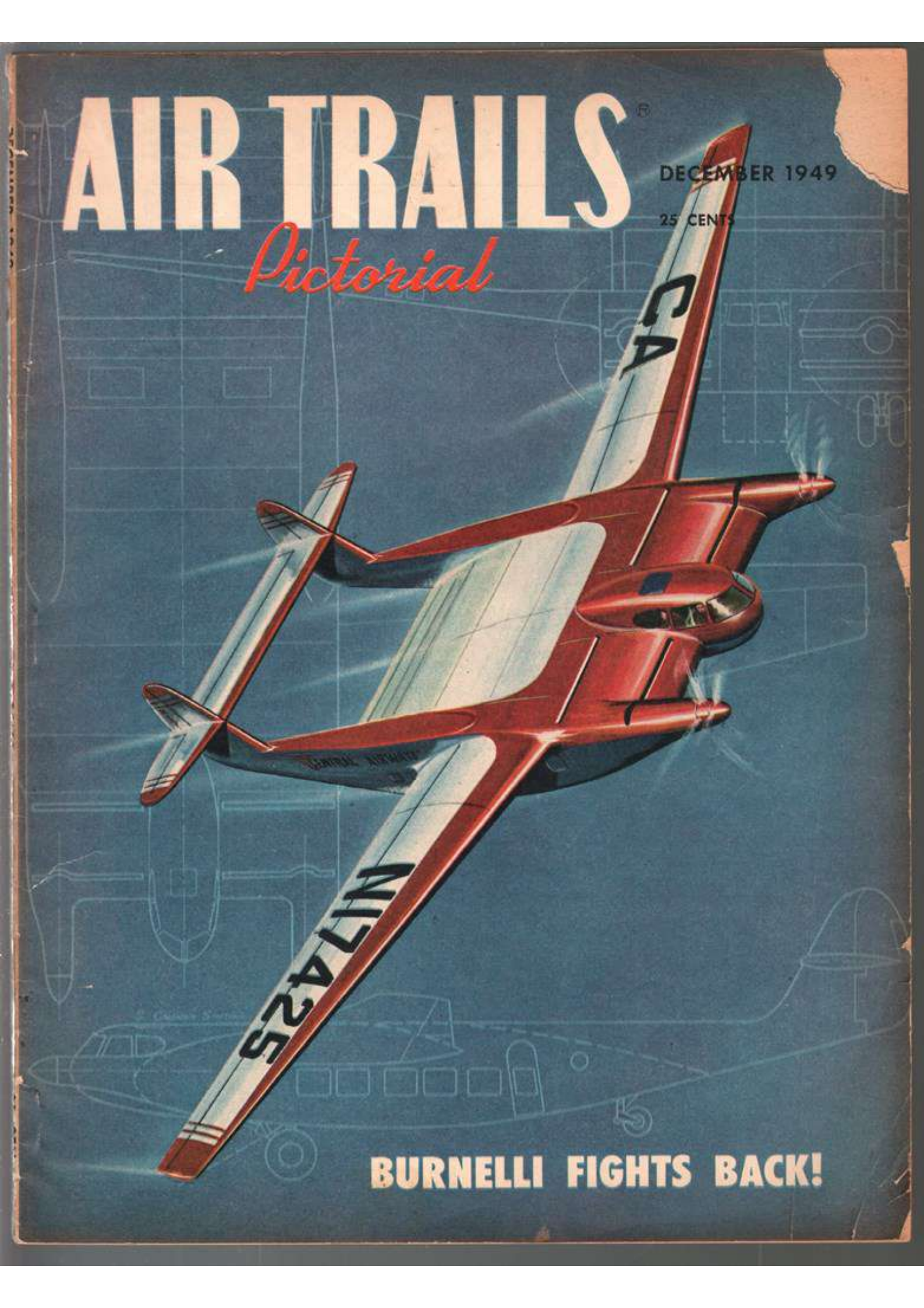


BURNELLI FIGHTS BACK!

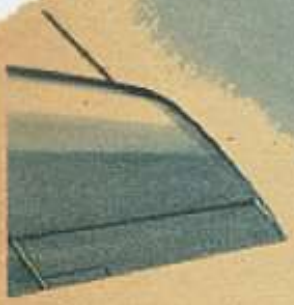
Flying Flattops

Aerial carriers are another solution for interception of fast long-range enemy A-bomb raiders

■ The shadow of the A-bomb bears heavily over American cities. . . . Yet if we depend on the conventional radar-flak-plane setup to defend our major areas from a Red-A attack, it would take a force the size of the Normandy invasion to protect eleven of our most important cities, and that with only 40 to 50 percent effectiveness. Guided missiles, which appear to be our best bet from the standpoint of accuracy and economy, are at least three years in the future.

The place to stop the Red bombers headed for Detroit is over the Arctic Ocean, not over Lake Huron. This problem calls for a type of interception similar to an aircraft carrier, in locations and at conditions of speed and altitude where the carrier is out of its element. Thus the solution, for the time being, is to project aircraft carrier characteristics into the sky to meet the enemy more than halfway.

Experience with our B-36 bombers indicates that the current type of fighter suffers from certain disadvantages when attacking a bomber, and one of the best ways to restore its position of combat superiority and still permit it to be used against bombers a long way from the target, is the flattop in the sky.



For exploration of this idea, Vincent J. Burnelli "designed" an airplane, or rather a flying task force, that would be able to cope with the current problem. The Flying Flattop is a four-engined aircraft a little larger than the B-36, an adaptation of Burnelli's airfoil fuselage idea. It has a lifting body 80 ft. by 80 ft., with outboard wing panels bringing the span to a total of 250 ft. The plane is 120 ft. long and would be powered by four 10,000 hp gas turbines.

The front and sides of the airfoil fuselage would be devoted to crew facilities and to search radar. Because of its size and capacity, some five tons of radar equipment could be carried with radar antenna as large and accurate as those of any ground station.

Inside the fuselage, most of the area would be occupied by the hangar housing a full dozen Burnelli-type fighters embodying the same lifting fuselage characteristics and powered by two jet engines. To increase range, the fighters would be equipped with a telescoping wing system which allows a section of the wing to slide in and out, folding wings and tail booms to facilitate stowage.

Planes would be carried inside an overhead trolley system hung on a retractable hook. They would be launched and recovered through a trap-door forming a portion of the lower fuselage skin and sliding back like a Fowler flap. In the event of action, the first two fighters launched would act as protectors for the flattop, taking position above and below the mother ship, with the other ten going after the enemy. Their relative low wing loading would give them an advantage over the invading bombers. The flattop would have provision for in-flight refueling of the fighters, and as most refueling equipment is reversible, the carrier could take on fuel in flight, increasing the length of time for remaining out on patrol.

Burnelli also points out that such an aircraft would not become obsolete with the advent of guided missiles, as it represents an ideal platform for air launching of air-to-air or even air-to-ground missiles.

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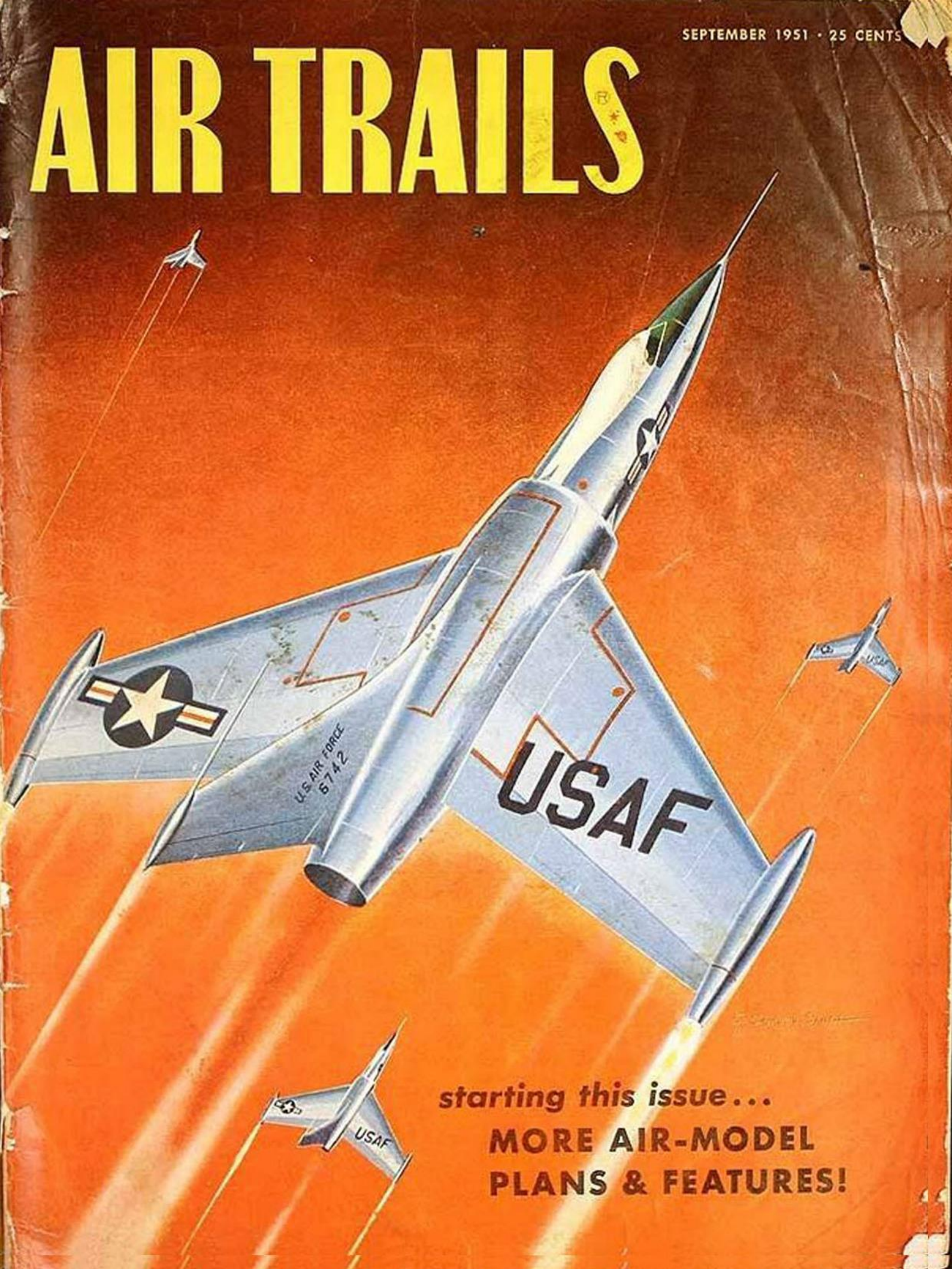

starting this issue...

MORE AIR-MODEL PLANS & FEATURES!

AIR TRAILS

THE LEADING MAGAZINE OF AIR PROGRESS AND AEROMODELING

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Plane: Airmen of Vision Winner. Cover: S. C. Smith

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FOR THE READER

8 Plane Talk
10 Air Notes
12 R-C—Howard G. McEntee
14 Airmen of Vision
15 Everybody's Doin' It!
16 Air Mobilization—Kendall K. Hoyt
19 Flying Tanks—Frank Tinsley
22 X-5
24 Air Progress: Wee Ones—D. Rolfe
26 Double Hanging
27 Friend or Foe?
29 Development Highlights
30 Finishing Your Model
32 Mac's Robot—Fran McElwee
37 Mirror, Mirror . . .
38 Folkerts Racer—W. A. Musciano
44 The E-x-t-e-n-s-i-o-n-i-s-t-s
45 Acrobatic Aces
48 Comet's Super Cruiser
49 Jim Walker's A-J Firebaby
50 Berkeley's Sandy Hogan
51 Enterprise's Towline Terror
52 K&B .29 and .32 Torpedo
56 Dope Can
58 Ollie—John Humphreys
60 Engine Starter—Earl Cayton
62 Western Roundup—Dick Everett
64 Questions and Answers
66 Alkie II—Roland Mayer
69 Free Flighter's Lament—W. F. O'Neil
70 Sketchbook—Drawings by Thomas
74 Whistle Wagon—Gerald Wagner
76 Showcase

FROM THE READER

All communications to the editorial offices should be addressed to Air Trails, 304 E. 45th St., New York 17, N. Y.

A&E Mechanic Checks Our Engines . . . Concerning a recent issue featuring "United Nations Air Force," I'd like to refer to the caption under the F-51H, which says it was "built for the British in 1940." In my personal library I have "Aerosphere—1943." It states that the P-51, let alone the H model, got into production on Dec. 31, 1942. I would suggest that more research be spent on the correct hp for the H model. Doesn't the H also have a Packard-built V1650 Rolls-Royce in it?

Where is the armament on the SB-17? You state it is fully armed. I see no tail guns, side guns, lower ball turret, upper powered turret or nose guns. The nose of your SB-17 has a radome in it; which is correct?

Having been a model builder since 1936, a civilian mechanic for the Air Force for 6½ years and for 3 years in the Air Force as a mechanic, I have tried to keep pretty well informed on American aircraft. Perhaps there are some details I have missed.

Robert J. Sward, Bountiful, Utah

• We are afraid you have completely misunderstood the caption under the F-51H photo in the issue referred to. It does not state that the H model was built for the British in 1940, but that it is vastly superior to the early model built for the RAF—but this was not the H. The engine of the H is a Packard Rolls-Royce V1650-11 developing 2200 hp with water injection. As far as these figures are concerned, they are the ones quoted by North American Aviation, builders of the plane.

Although the pictures of the SB-17 and the SB-29 do not show the armament, those operating on rescue missions around the waters of the front do carry guns.

That Team Entry Rule . . . In reading the "Western Roundup" section of your July issue I was overcome by the way Mr. Everett handled the report of a Bakersfield contest. The description of two flyers trying to beat the team entry rule was good, but the manner in which the problem was solved may result in much confusion at subsequent contests.

The team entry rule specifies that one team member must be designated to fly the model(s)—with team entry made in the age class of the oldest entrant.

The A.M.A. rules were very thoroughly investigated during the briefing meetings of the Fourth International in order to establish interpretations of any controversial sections. Under the provision for team entry it is not probable that an interpretation could be made that would fit the situation described by Mr. Everett.

Mr. Everett suggests that an immediate ruling be made to cover the situation. I agree in principle but feel that only an explanation of the present rule is needed, which will certainly save a lot of trouble for many contest directors for the rest of the current season.

Warren E. Bartlett, Vice President, Academy of Model Aeronautics

Housegirl Remembers P-51s . . . I'm in Japan with my father and mother. I guess you get quite a few letters from occupation personnel. I think Air Trails is tops for modelers' dope. I'm 16 and have just started on model planes and each month get it at the PX.

I was reading "The Readers Write" section when I came upon the letter from C. S. Cobb III, Rye, N. Y. He seems to think a lot of the Thunderbolt. I'll admit that Thunderbolts are fine planes, but I read an article reporting that several times P-51s departed one flight to escort another. I don't think the 51 was ever "chicken" because of gas. [Evidently the writer is referring to Mr. Cobb's statement that the Mustangs were forced to turn back over Holland and France while the Thunderbolts, with the aid of drop tanks, went all the way with the Forts into Germany—Ed.]

Our housegirl told me she saw 47s only once or twice, but P-51s would come in hordes from "oki" or big ships. The B-29s were seen most and she said they usually flew over her house on the way to Tokyo or Yokahama. When they bombed Yokosuka she said the P-51s would strafe and dive-bomb a ship so much she would wish it would sink so they would go away. By the way, the ship is solid concrete and is still out there in the harbor.

A friend of mine said that when he was on the "Shangri-la" they lost 5 P-47s to each 51 when they were near Malta. He had to make repairs a lot, however, out of wing-tips and parts for the tails of the P-51s as they were really shot up but "took it."

Gene Thompson, c/o Postmaster, San Francisco, Calif.

Stamps and Approval . . . I enclose a few foreign stamps that I would like you to send to the veterans' hospital to which you send yours.

Before I received a gift subscription from a friend, I got Air Trails every month at the newsstand. I find it so much more convenient that I would like to encourage many more modelers to subscribe to it.

Bobby Livingston, Manteca, Calif.

• Bobby's "few" stamps were actually several hundred important foreign issues. He is referring to the office custom of forwarding to a local vet hospital all stamps received on foreign mail.

What the G.I.s Say . . . Concerning your publication Air Trails Model Annual for 1951, I have found it practically impossible to locate a copy anywhere between here and Korea. I believe it will be well worth while to write direct to you if the supply is not exhausted.

Many a G.I. has gone through my copies of ATs with the same reply: "Gee! Where'd ya get this?" If you put much more in them you'll have to publish it bi-monthly.

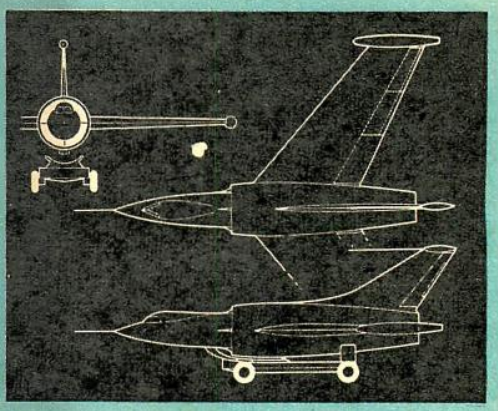
Cpl. Carl F. Anderson, c/o P. M., San Francisco, Calif.

From the Red Cross . . . May I take this opportunity to tell you how very much the Red Cross appreciates the fine cooperation of Air Trails during the 1951 Fund Campaign. We value very highly the support you are giving through the reproduction of the Red Cross emblem appeal in the April issue—a contribution that is of immeasurable help to chapters, nationwide.

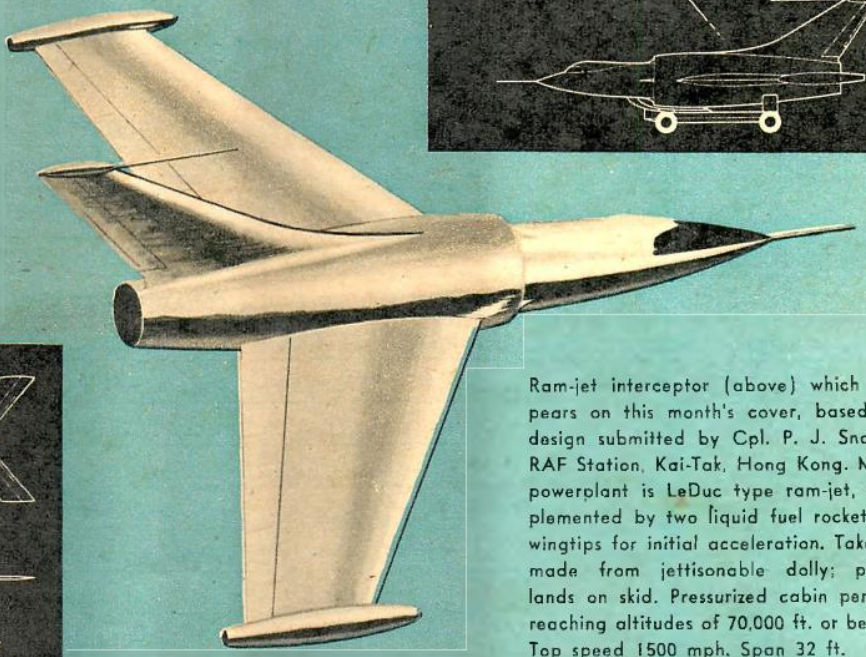
Edwin H. Powers, The American National Red Cross

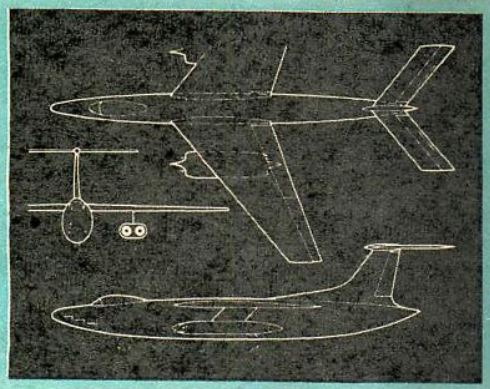
(Continued on page 9)

Airmen of Vision
DESIGN COMPETITION

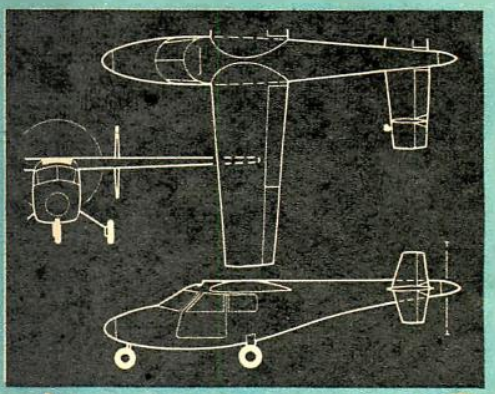


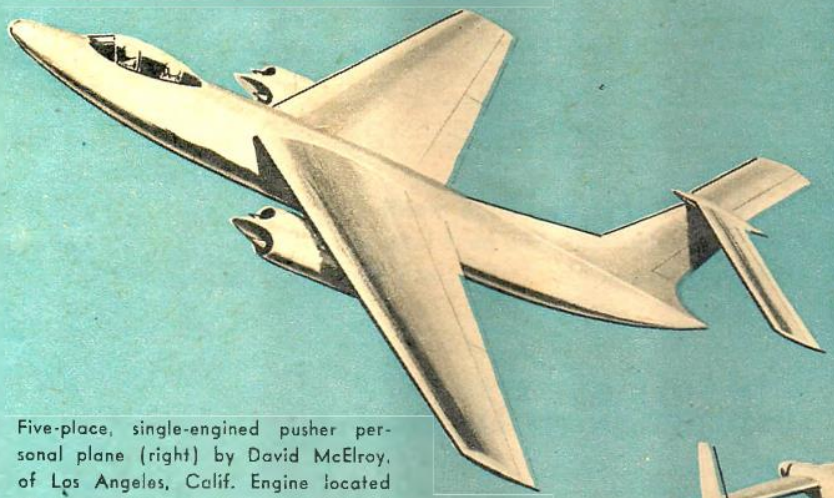
Four-engined bomber (below) by Erwin Ewry of Chicago, Ill. A neat, clean design which should give excellent performance. Plane has wingspan of 69 ft., 40 deg. sweepback; length 57 ft. Power plants: four 5200 lbs. thrust jet engines paired in two nacelles. Armament: machine guns in nose, internally stowed bombs and rockets. This type of armament is well suited for ground support duty. Speed 750 mph, range 2000 mi.





Ram-jet interceptor (above) which appears on this month's cover, based on design submitted by Cpl. P. J. Snodin, RAF Station, Kai-Tak, Hong Kong. Main powerplant is LeDuc type ram-jet, supplemented by two liquid fuel rockets at wingtips for initial acceleration. Take-off made from jettisonable dolly; plane lands on skid. Pressurized cabin permits reaching altitudes of 70,000 ft. or better. Top speed 1500 mph. Span 32 ft.



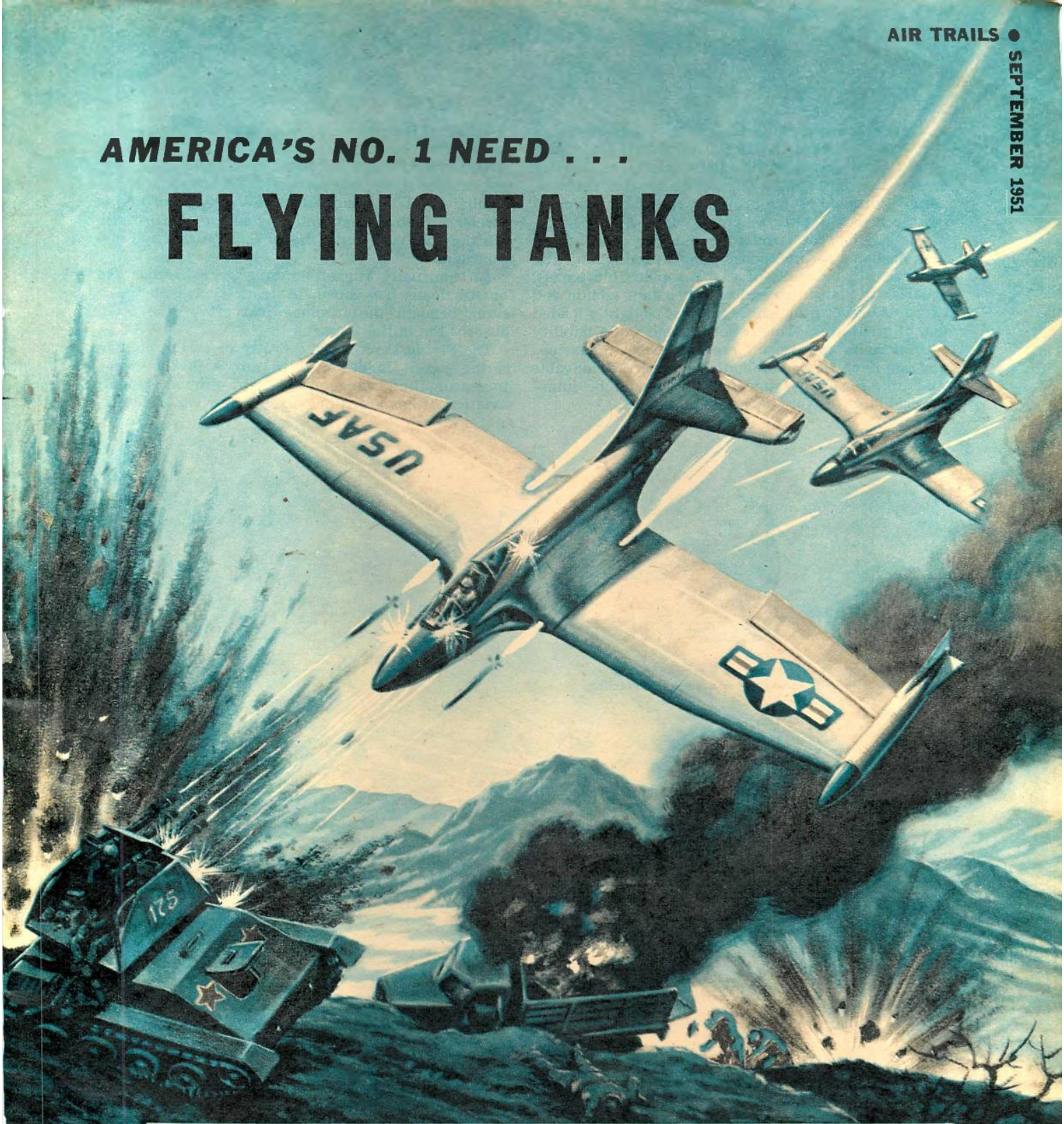


Five-place, single-engined pusher personal plane (right) by David McElroy, of Los Angeles, Calif. Engine located above and behind pilot at center of gravity for better controllability. Driving a propeller in rear of fuselage though extension shaft, the 185 hp flat-six is cooled by air entering through scoop at cabin top. Span 34 ft., length 30 ft., max. speed 150 mph. Normal cruising range 600 mi.

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and Judges. The designs may be of any type, commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should keep copies of all material submitted. Mail entries to Airmen of Vision, c/o Air Trails, 304 E. 45th St., New York 17, N. Y. Editors regret that because of large number of entries they cannot enter into correspondence on A. of V.

AMERICA'S NO. 1 NEED . . .

FLYING TANKS



■ A tough, heavily armored ground-strafing plane, which can bull its way in through clouds of flak, deliver its big punch and get out again in one piece is considered the No. 1 need of the Air Force. The current super-speed, hi-flying fighter plane, costing around half a million, loaded with special gadgets useful only at altitude is pretty much wasted in ground attack work, say the ground forces. Skimpily armored and wide open to any kind of flak, quite a few were brought down or badly beaten up in Korea by everything from burp gunfire to showers of hand-heaved stones. Now that the jets have proven to be unusually stable gun platforms and fully capable of efficient, on-the-deck operations, the logical development is an expendable Flying Tank.

Text and Art by FRANK TINSLEY

Grover Loening, veteran designer and N.A.C.A. consultant believes the 10,000 lb. thrust jet engine now makes possible an attack plane as heavily armored as any tank. The jet eliminates the vulnerable propeller and provides sufficient power to lift the armor's great weight.

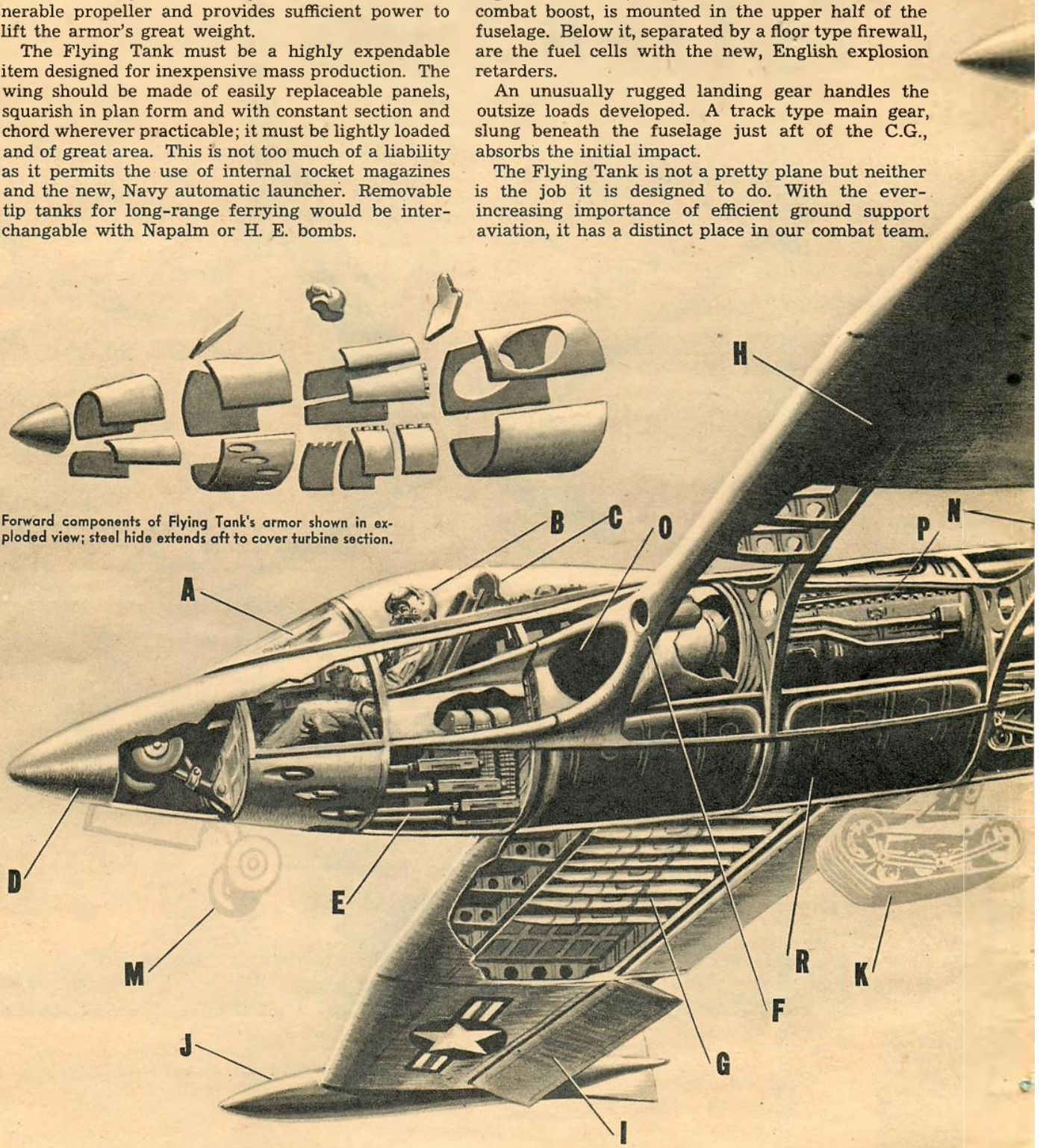
The Flying Tank must be a highly expendable item designed for inexpensive mass production. The wing should be made of easily replaceable panels, squarish in plan form and with constant section and chord wherever practicable; it must be lightly loaded and of great area. This is not too much of a liability as it permits the use of internal rocket magazines and the new, Navy automatic launcher. Removable tip tanks for long-range ferrying would be interchangable with Napalm or H. E. bombs.

To avoid the possibility of frontal fire penetrating to the compressor, the intake duct is of the "Y" type with ports in the wing roots, well outboard of the engine. The latter, complete with an afterburner for combat boost, is mounted in the upper half of the fuselage. Below it, separated by a floor type firewall, are the fuel cells with the new, English explosion retarders.

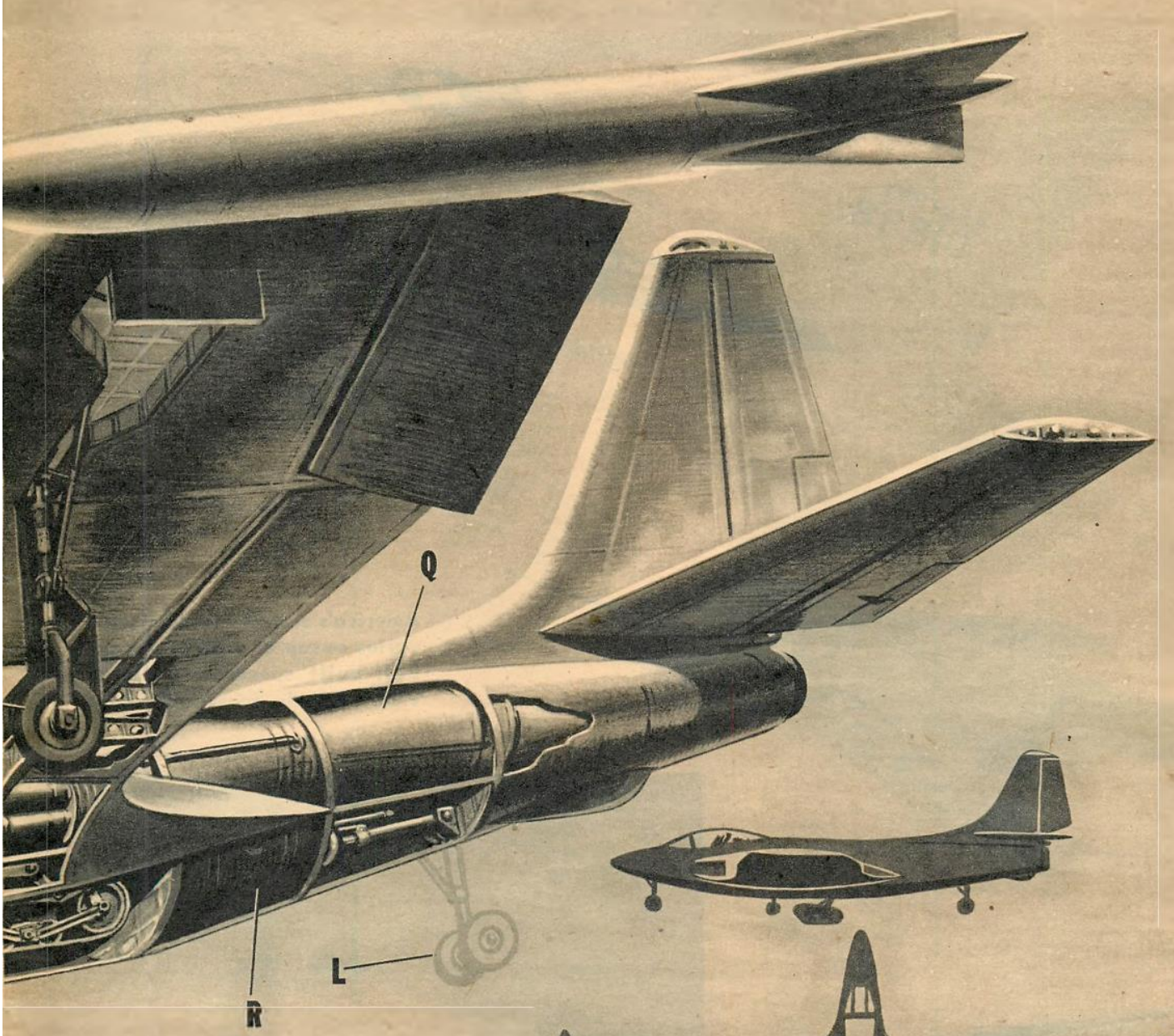
An unusually rugged landing gear handles the outsize loads developed. A track type main gear, slung beneath the fuselage just aft of the C.G., absorbs the initial impact.

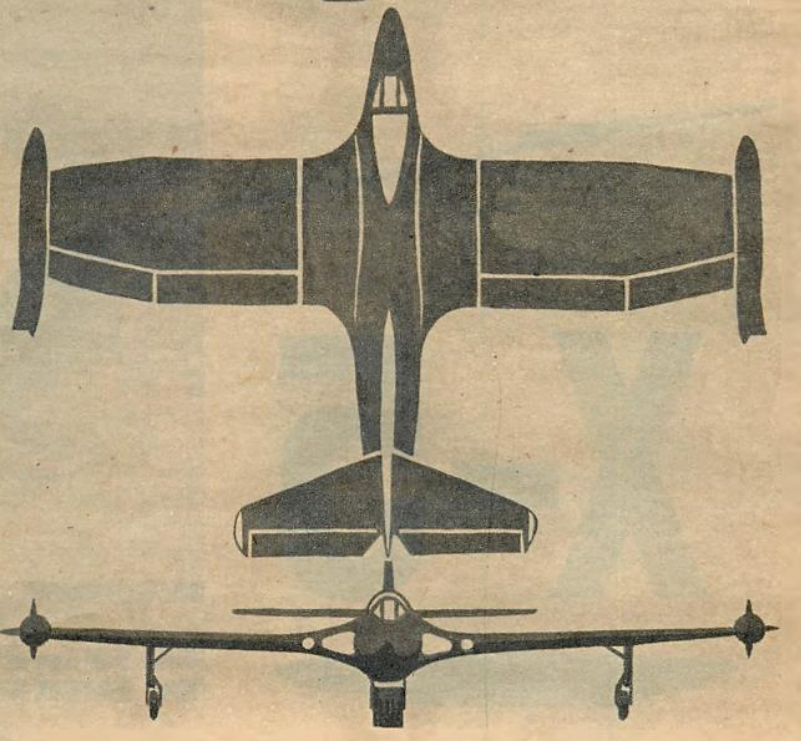
The Flying Tank is not a pretty plane but neither is the job it is designed to do. With the ever-increasing importance of efficient ground support aviation, it has a distinct place in our combat team.

Forward components of Flying Tank's armor shown in exploded view; steel hide extends aft to cover turbine section.



The super-power jet engine makes the heavily armored ground attack plane a practical possibility by eliminating its Achilles heel—the vulnerable propeller. The big question is: when do we get them?





IMPORTANT FEATURES OF THE FLYING TANK

A—Bullet-proof windshield
B—Pilot's flak-proof helmet
C—Rear cockpit armor
D—Heavily armored nose cone
E—Six 20-mm shell guns
F—Rifled auto. rocket launcher
G—Rocket magazine in inner wing panel
H—Large area wings to carry weight of armor
I—Northrop type "deceleron" aileron/air brake
J—Wingtip fuel tanks or Napalm bombs
K—Main track landing gear to take heavy impact
L—Tail wheels for initial landing
M—Ship drops onto nose wheels after initial impact is absorbed
N—Steadying side wheels for taxiing
O—Divided engine air intakes
P—10,000 lb. thrust axial jet engine
Q—Afterburner
R—Self-sealing fuel cells